ONTARIO 2002

A report
of the

Task Force to Review the Ontario Technology Fund
in the
Context of an Innovation-Based Society

to the

PREMIER'S COUNCIL ON ECONOMIC RENEWAL

February, 1993

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Ontario

Premier's Council on Economic Renewal

The views presented in this document are those of the Premier's Council Task Force to Review the Technology Fund in the Context of an Innovation-Based Society and are not necessarily those of the Premier's Council on Economic Renewal or the Government of Ontario.

It is important to emphasize that this is a report to the Premier's Council and not a report of Council. A draft of this report was presented to the Council on May 1, 1992. A revised version reflecting the Task Force's final recommendations was presented to Council on September 25, 1992.

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Introduction by the Deputy Minister

I am very pleased to introduce this report which was submitted to the Premier's Council on Economic Renewal by the people who have come to be known as the Tech Fund Task Force of the Council.

This report is being published to promote discussion of the issues the task force considers to be important to the future prosperity of Ontario.

The authors of the report have presented us with a vision of Ontario ten years from now. They describe an Ontario economy that depends on innovation for the creation of wealth to a far greater extent than is the case today. The vision reveals the outline of a design for the institutions and relationships required to make such an economy work.

To make their points, the authors have resorted to the interesting device of reporting the presentation given by the Premier of the day to a meeting of the Premier's Council in 2002. The report returns to the present to recommend actions which should be taken now to move us toward the vision.

Several of the recommendations have already been accepted, and are being acted on. They are referred to in the text.

In particular, Recommendation No. 22 was accepted on the spot at the meeting of the Premier's Council on Economic Renewal in September, 1992. The publication of this report is the outcome of that meeting.

With the publication of *Ontario 2002*, the Tech Fund Task Force has ended its work and is dissolved. Its momentum will be maintained by the two task forces which it proposed in recommendations No. 2 and No. 6.

It remains for me to express my personal gratitude to all the individuals from outside government who served on the Tech Fund Task Force as volunteers, and particularly to Dr. Fraser Mustard. Their generous donation of time and attention to the work of the Premier's Council is eloquent testimony to their belief in its importance for the future prosperity of the province.

I also wish to acknowledge the contributions of the members of the Ontario Public Service who joined in the work of the Tech Fund Task Force. Their interest and participation in it will help government translate the task force's recommendations into appropriate actions.

Finally, I wish to invite the reader to join the discussion on Ontario's future by making comments about *Ontario 2002*. Written comments sent to me at the above address would be most helpful because they would help us keep an accurate record of the ideas submitted.

T. A. Brzustowski
Deputy Minister
Premier's Council on Economic Renewal

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1. Introductory Remarks by the Chair

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1. Introductory Remarks by the Chair

The Ontario Technology Fund was established in 1986 with the goal of helping to build a more innovative economy within the province by harnessing the ideas emerging from research and development (R&D) groups in universities and throughout the private sector. By 1992, the original $1 billion Fund was fully committed. In the six years that the Technology Fund has been in existence, it has become increasingly clear that we are in the midst of profound global economic changes. In view of this, the Premier's Council on Economic Renewal established a Task Force to review the Technology Fund in the context of the new global marketplace.

These changes are being driven by idea-based innovation. By innovation, we refer not to incremental improvement, but rather to fundamentally new approaches to doing things. Idea-based innovation depends on scientific and technological capabilities, and on the ideas that flow from the R&D process as well as the other components.

The new emphasis on idea-based innovation is at the heart of how wealth is created in society. By wealth creation, we do not mean wealth accumulation by individuals or organizations, but rather the process by which a society increases its productive capacity to improve the quality of life of its members.

The growth of prosperity in Western countries over the last 250 years has been the result of both technological and institutional innovation. But today, we are witnessing a profound shift in the speed and intensity of innovation. The vast majority of Canadian economic development in the past was based on exploiting previous innovations, involving the extraction, harvesting, and physical transformation of raw materials.

Today, an increasing percentage of economic activity is based on the capacity to innovate, rather than on exploiting previous innovations. Increasingly, it involves the application of ideas, rather than the physical transformation of objects. Throughout this document, we use the term "wealth creation through idea-based innovation" which refers to this concept.

It is critical to recognize the profound implications of this shift in the context of the new global economy.

A. Wealth creation through innovation requires the development of a new framework of understanding about ideas and their relation to economic growth. Incorporating the role of ideas (technological innovations) into the neoclassical theory of economic growth results in major new insights, and forces a reconsideration of economic policy and regulations. We learn that a sustained investment in ideas to produce tradeable goods and services can permanently raise a country's economic growth rate. On the other hand, an economy that fails to come to grips with a major techno-economic change will fall behind in wealth creation and have great difficulty in being able to sustain its prosperity. Rethinking many of our assumptions about private and public sector businesses, private and public investment, and the role of the institutions of society in wealth creation results in the need for significant policy, regulatory, and institutional changes.

B. The institutions we refer to control the development and allocation of capital, labour, and knowledge within the economy. They include firms and business organizations, financial institutions and pools of capital, labour organizations, educational institutions, governments and their various agencies, and the systems we use to measure performance. The critical importance of institutions to the wealth creation process is best captured in Rosenberg and Birdzell's description of *How The West Grew Rich.*[1] What is at issue now is our ability to adapt our existing institutions and evolve new institutions for wealth creation in the new global economy.

C. As a specific example of institutional change that is required, we refer to a well-documented weakness in the Canadian economy — the lack of a sufficient number of innovative enterprises in the primary wealth-creating sector. This sector refers to enterprises that produce tradeable goods and services and participate in the global economy. Tradeable goods and services include those that are exported, and those that face international competition, even if they are not actually exported.

In observing other economies founded on idea-based innovation, we see the evolution of what we refer to as "innovative business enterprises" (IBEs). These new business enterprises are establishing a variety of inter-firm relationships that enable joint marketing, R&D, and financial underwriting. They are developing the capacity for continuous idea-based innovation in products and services. Because of their understanding of the requirements to finance idea-based innovation and the risks involved in it, they are moving from traditional individualistic entrepreneurial activity to more collective entrepreneurial arrangements. IBEs are not organized as a hierarchy. They comprise interacting groups of businesses with ownership and strategic alliance relationships. They create links with financial institutions to ensure effective financing of new innovative ideas and secure market share. The scale and scope of these developments in countries such as Italy, Germany, Sweden, Taiwan, South Korea and Japan, are impressive.

IBEs seek strategic advantage on the basis of innovation in products and services, process, organization and capacity to capture market share. To achieve the new dynamic, it is necessary to have organizational flexibility which leads to a different approach to the organization of work than that of most traditional Canadian businesses. Continuous learning is crucial to maintaining competitive advantage. Labour-management relationships facilitate continuous learning within the context of security of job opportunity, and enable effective restructuring to meet changes and opportunities. Ideas for improvement come from everyone including customers, workers, suppliers, staff, and managers. The interaction of people engaged in functionally distinct activities demands new working arrangements within a context of trust and understanding of reciprocal obligations.

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[1] Nathan Rosenberg and L.E. Birdzell Jr., *How the West Grew Rich*, New York: Basic Books, Inc., 1986.

D. Wealth creation through innovation requires new relationships throughout society. At one level, a prosperous, innovative economy depends on a mixture of competition *and* cooperation. This has far-reaching implications for public policy. It means that the task of government is not to establish policies and regulations based on a neoclassical theory of economics (such as our current competition laws), but to develop policies which are more appropriate for our new understanding of economic growth and the change in the global economy. Government must develop strategic policies in cooperation with the private sector, not plan for the private sector. Government has to help create the framework and infrastructure for sustaining competitive success and work to ensure that the enterprises which provide the real dynamic thrust can respond quickly as new markets emerge.

Developing strategies is not an intellectual project for detached government policy makers. At a second level, a prosperous innovative economy depends upon the *integration* and *interaction* of key sectors. Thus, structures for codetermination through forums composed of government, enterprise leaders, financial institutions, labour, the education and research sectors, and communities will increasingly emerge. We define codetermination as a process which results in developing a framework of understanding and cooperative action, rather than unilateral decision-making by any one sector. Developing frameworks of understanding for both public and private sector organizations in an innovative economy is difficult. Unless a process of codetermination is developed it is doubtful we can build the understanding and move to an innovative economy.

Processes of codetermination involve people from different parts of society putting their self-interest into a broader context. The web of the framework of understanding and commitment that ties individuals into a community is subject to erosion unless norms, shared understanding, and mutual obligations are reinforced or sustained by a collective commitment, and further reinforced by shared activities.

The transition Canada is now experiencing is one of deep structural change in our economy with profound changes in our institutional and social frameworks. It is a conflict-ridden process and will proceed effectively only if there is adequate understanding and commitment. Codetermination is one way to minimize conflicts.

E. Wealth creation through innovation requires a new understanding of the relationship between wealth creation and the health and well-being of individuals in society. At a very basic level, our health and well-being as humans are largely determined by the quality of our social and physical environments. The negative effects of a declining economy on health and human development, particularly on children, are well known. Maintaining and enhancing our social and physical environments depends on the ability of our society to create wealth. But equally, the ability to create wealth through innovation depends on a cohesive social framework, which recognizes the priority and importance of building a strong primary wealth-creating sector and promotes the dispersion of economic activity and widespread sharing of benefits within a high quality social and physical environment.

Ontario 2002

In creating the framework to review the Tech Fund, the Task Force became convinced that any approach that did not communicate the need for radical, and not just incremental change, would be less than adequate. This led us to present our report in a way which departs from the traditional format. We chose to produce it as a briefing by a Premier to a newly constituted Premier's Council in the year 2002.

We believe if we adopt an appropriate, far-reaching vision for the future, the citizens of Ontario will not only sustain, but improve, the quality of their lives. This vision has to focus on our primary wealth creating capacity so as to maintain and strengthen the quality of our social and physical environments.

If we act quickly, it's still possible to develop the sense of collective urgency and achieve the vision of 2002 outlined below. We urge readers to imagine what kind of society they would like to be living in ten years from now, and then try to determine whether or not their perceived short-term interests still fit when viewed in this broader context. We have only a short time to change course if we want to realize a positive future!

We could have opted for a less positive vision with a weaker base in primary wealth creation that would be more probable if we fail to act now. That, however, will lead to diminished expectations and make it an extraordinarily difficult, if not impossible, task to maintain a reasonably good quality of life for most citizens. We have chosen the positive vision.

Chapter 2 of this report is therefore the future Premier's report on the state of affairs in the year 2002, and Chapter 3 provides the Premier's summary of the key events and developments that resulted in the progress apparent from the perspective of 2002.

There are risks involved in presenting our report in this fashion. Some may dismiss our view of the future as fanciful. Some will argue with specific details of the examples we have given to illustrate our perspective on future opportunities. Others will object to our selection of examples, perhaps because we have undoubtedly left out ideas they think are more worthy than the ones we included. We will not argue with these points of view; we will only urge people with better ideas to put them forward.

Many others will disagree with the premises for many of the ideas contained in the "history" in Chapter 3. For example, some will conclude that our report advocates that government "pick winners," and will dismiss this idea as impractical and wrong-headed. A careful reader will note that our report does not recommend that government pick winners in any traditional sense, but does recommend that our society evolve partnerships among "thinkers and doers" to create an environment and investment instruments that enable winners to emerge through competition in the global marketplace.

Some others will argue that in venturing as far into the future as we have, the Task Force has grossly exceeded its mandate to advise on the future of the Technology Fund. This potential concern points to the more profound reason why we have chosen to present our report as we have. Some problems cannot be solved from the "front end." They can only be solved by working backward from a clear understanding of a desired future state. We believe that our society's ability to create wealth through idea-based innovation is a problem of this kind. From the present, looking forward, the possibilities are endless, and the choices unclear. From the future, looking backward, it is easier to see the paths we must take. Stated differently, societies require both a vision and a strategy to move ahead. The role of the Technology Fund has to be seen in this context. Our recommendations concerning the Fund are framed accordingly.

We hope that readers of this report will be inspired to make a personal commitment to create the real history that will be told in 2002.

This report is entitled *Ontario 2002*, but there is no reason why it could not be called *Canada 2002*. The Task Force believes that all of the ideas presented can and should be implemented in a national context. Indeed, because Canada has a small population, it will need to bring all of its population together to build a strong innovative economy. As a Task Force of the Ontario Premier's Council on Economic Renewal, we must necessarily deal primarily with Ontario, but we encourage all readers, particularly readers in other provinces, to consider the possibilities if we substituted "Canada" for "Ontario" throughout this document.

In some cases, we have referred superficially to matters that are being dealt with by our colleagues on other Task Forces of the Premier's Council on Economic Renewal, the Premier's Council on Health, Well-being and Social Justice, and the Round Table on the Environment and the Economy. We will, of course, submit cheerfully to correction where we have erred.

The appendix contains a listing of the individuals to whom acknowledgements are due. We would like to pay a special tribute to the government officials who participated in the meetings of the Task Force, and to the many others who provided information and advice from "behind the scenes". We hope that the many public servants who have dedicated their careers to the public interest will not be discouraged or offended by our comments on present weaknesses in the Ontario government, or on the need for structural change. We believe that the move to an innovative economy requires institutional change throughout society and hope that our recommendations will stimulate some innovation.

The appendix also contains a brief history of the Technology Fund, its programs, and the transition to Technology Ontario. A background section on key concepts is included to help readers better understand the ideas that underlie this report.

Recommendations

In order to move in the directions implied by *Ontario 2002*, our recommendations are as follows. The work begun by the Task Force should continue, but we propose that the Task Force be divided into two new Task Forces, one dealing with Strategic Opportunities, and one carrying out a more detailed analysis of the institutional links and changes involved in building an innovation-based society. Beyond the work of the Task Force, we believe that the Council should take on the role of developing an overall strategic plan for wealth creation through innovation in Ontario. In addition, due to the links among the social environment, physical environment, and economic growth, we support the process to develop Strategic Goals for Ontario, integrating the work of the Premier's Council on Economic Renewal, the Premier's Council on Health, Well-being and Social Justice, and the Round Table on Environment and Economy.

The Technology Fund has been a small, but critical step by the government to stimulate an innovative economy. This initiative has already mobilized human capital, changed attitudes and created new institutional links critical to innovation. Because innovation is a long process, it is of fundamental importance that this initiative be sustained and strengthened over the next decade as we work at building our new economy. It is essential to give a high priority to those actions and investments that are helping to produce a change.

We believe, therefore, that: the main Tech Fund programs must be sustained; the government needs to rationalize and consolidate its programs for technology development; its knowledge base and internal capabilities relating to Ontario's technology infrastructure need to be enhanced; and that a much stronger coordinating mechanism should exist to ensure that the main support programs for innovation are mutually reinforcing in enhancing our transition to wealth creation through innovation.

We recognize that the magnitude of changes required in our economy and the associated effects on our social and physical environments are daunting. The risk is that if we fail to implement this transformation in wealth creation, it will be at great cost to our future society.

Governments in particular have a key role to play in maintaining a sound social environment in which individuals live and work. They must ensure that adjustment programs not only involve education and training, but also opportunities for people to do meaningful things. How governments do this with diminishing resources will be an extraordinarily difficult task. It is clear it can only be done in partnership with communities and the individuals within those communities.

Will we be among those that succeed in adapting our institutions to the new paradigm for wealth creation? We believe it is possible, but that a tremendous initial effort will be required to overcome some key bottlenecks. As a society, we do not have a strong tradition of creating cooperative efforts with business, government, workers, the education and research sectors, and communities. Even within each of these areas, cooperation is often the exception rather than the rule.

Looking to our history, however, we learn that we have at times combined our efforts to achieve great things. Confederation is perhaps the best example in political terms. The best economic example is the rapid development of Canada's industrial base during and after the Second World War. In an exceedingly short time, committed individuals and organizations were able to dramatically expand Canada's industrial capacity. Bureaucratic and other obstacles were not permitted to stand in the way.

We hope that our report will help create a vision of where we can be in 2002. It is clear that the steps taken now will set our course ten years from now. Failure to move in the right direction could make life for all of us difficult in the future.

J. Fraser Mustard
Chair,
Task Force to Review the Ontario Technology Fund
in the Context of an Innovation-Based Society

What follows is a presentation of the vision of Ontario in 2002, or more specifically, a design for an innovation-based wealth creating economy for the province, as well as a discussion of how that vision might be reached and what needs to be done today to get it started. To present the vision, the Task Force has chosen the device of a speech that might be delivered by the then Premier of Ontario, at a meeting with the Premier's Council in September, 2002.

2. The Vision of Ontario in 2002

Ontario

Presentation by the Premier of the Province of Ontario

to the Opening Meeting of the Premier's Council

September 17, 2002

CHECK AGAINST DELIVERY

It has become a tradition in Ontario that one of the first acts of a Premier after a general election is to meet with the Premier's Council. I am pleased to carry on this tradition, and to welcome those of you who are new members to the Council.

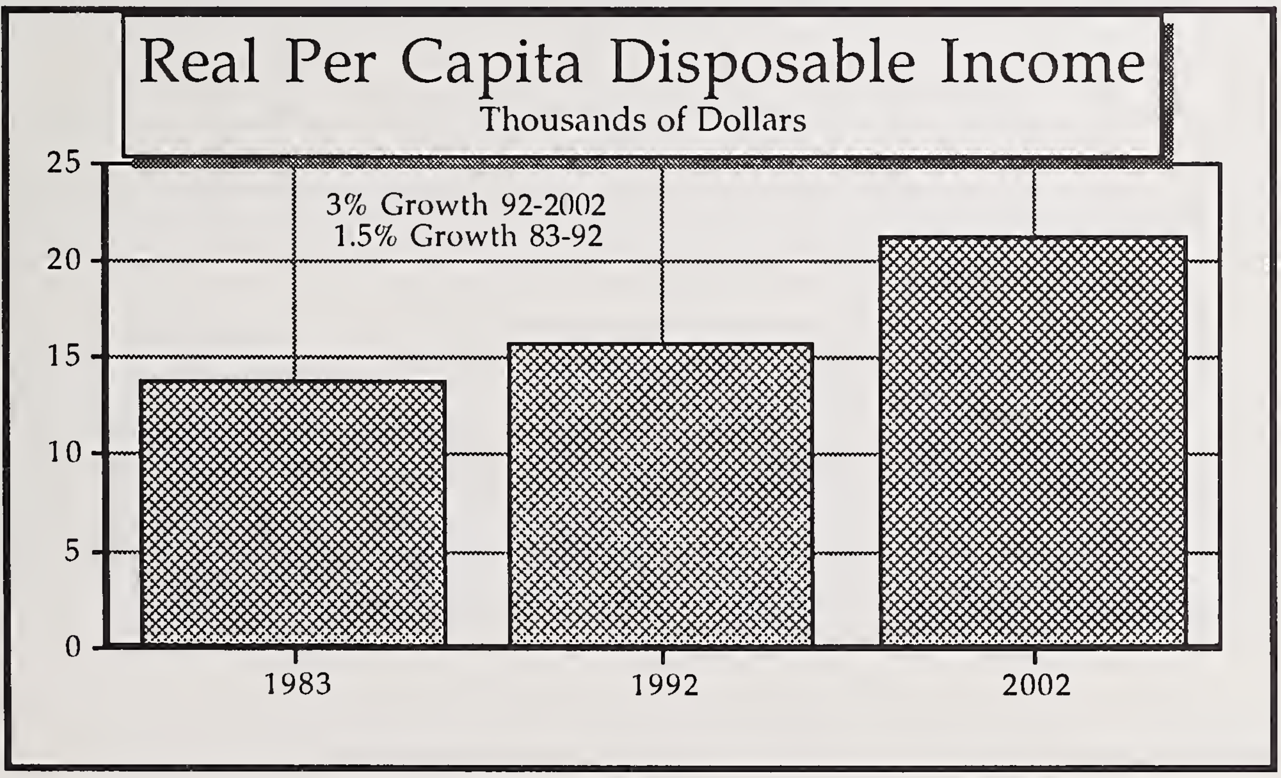
The objective of our meeting is to identify the priorities we as a society must address over the next decade. To set a backdrop for the discussion, I would like to reflect back on the progress we as a society have made over the past ten years. The period from 1992 to 2002 was one of fundamental change for Ontario. I know that parts of this story are familiar to all of you, but I think it is instructive and inspiring to recognize the magnitude of the changes that took place.

Three principal themes emerge from this retrospective. During this period, Ontario recaptured its sense of itself as a society, and made great strides in sustaining and enhancing the well-being of its residents. It reshaped existing institutions and developed new ones required to create wealth through idea-based innovation, and restructured its economy accordingly. Ontario also became committed to the concept of sustainable development, and as you all know, we are now playing a major role in the global effort to repair our biosphere.

The success of this effort can be seen everywhere we look.

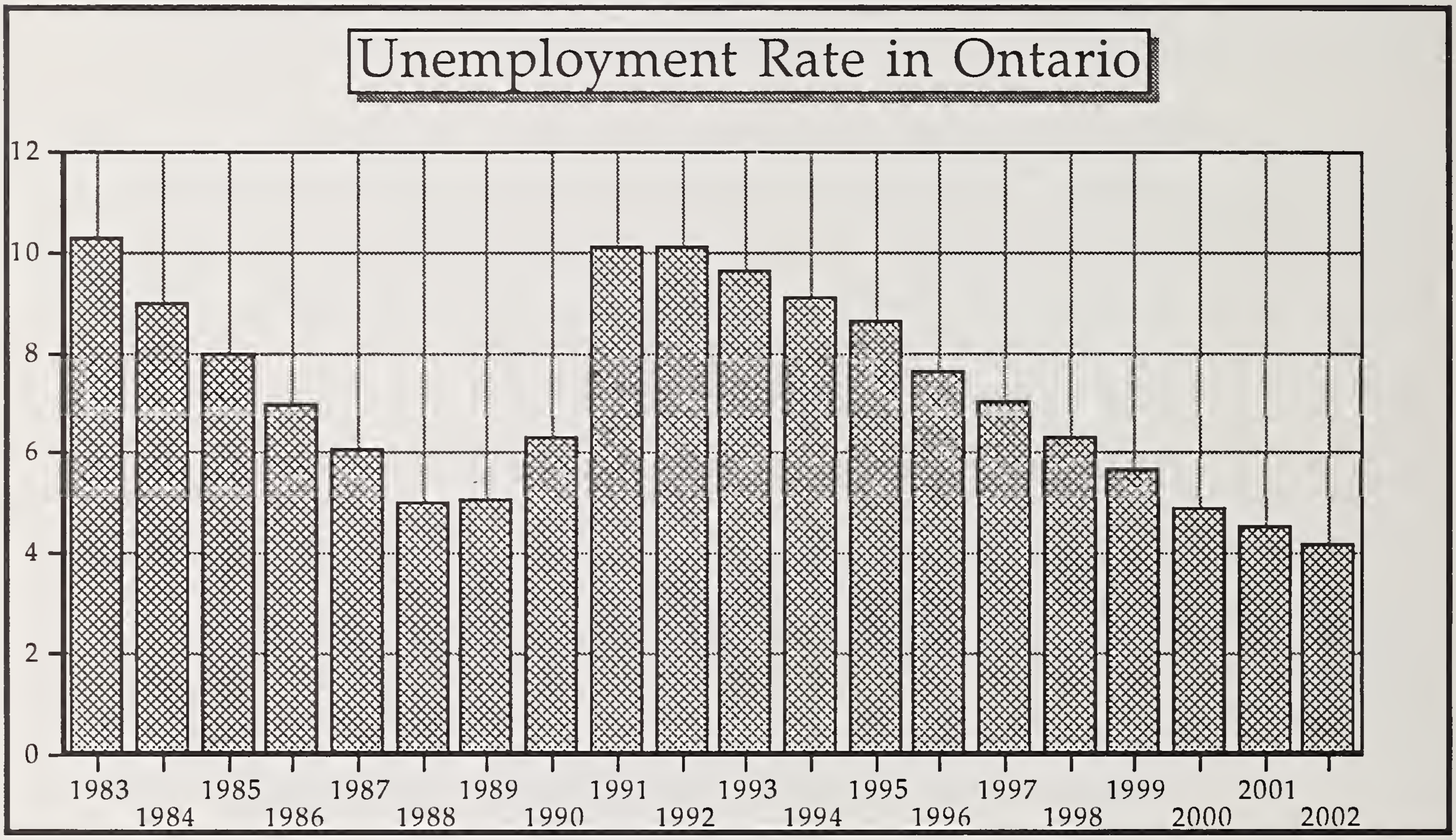
Well-being

First, we have made major strides in improving the level of well-being of Ontarians.



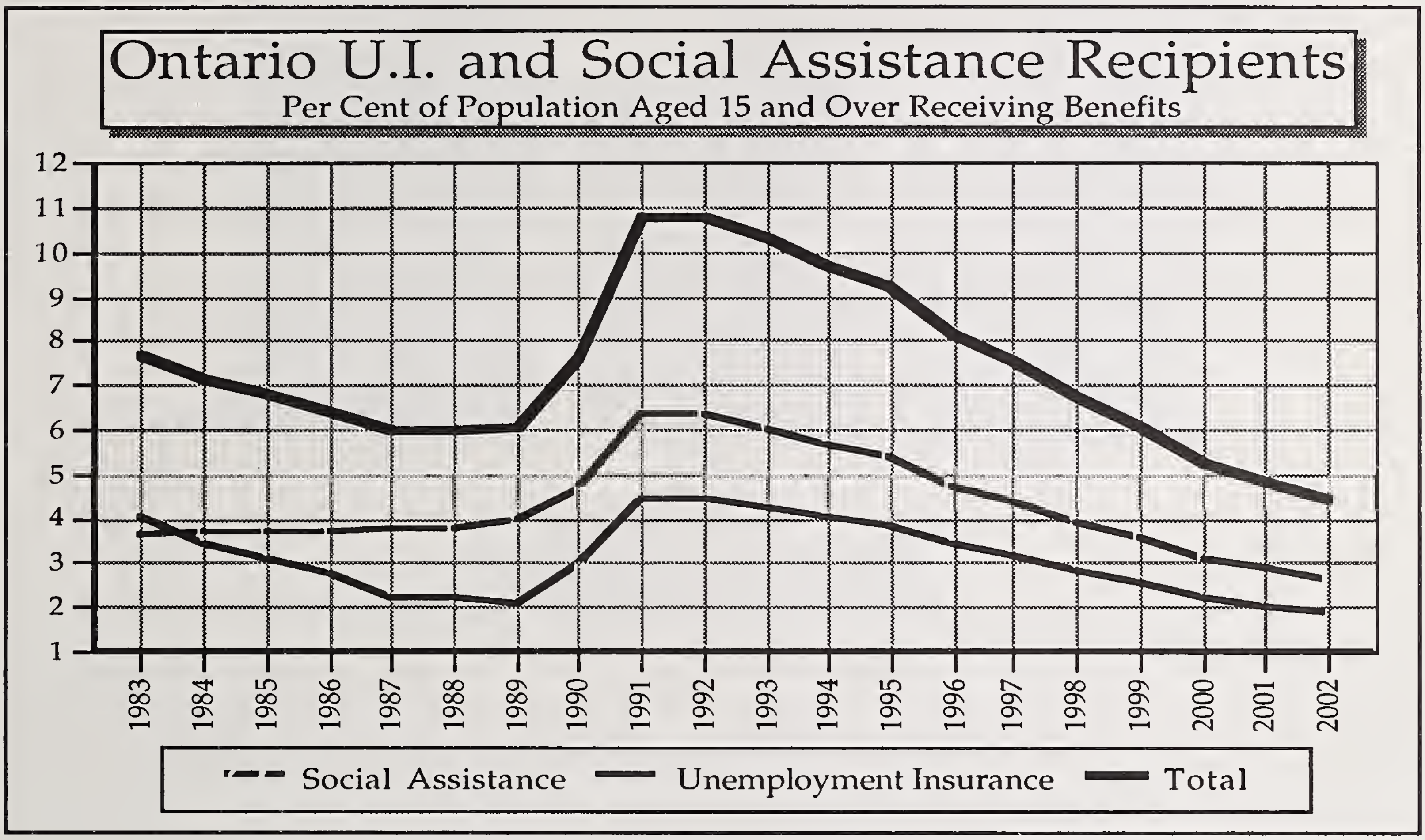
The province's income per capita grew slowly in the early 1990s, but increased to one of the highest growth rates in the world by the end of the decade. We have kept pace with the other leading wealth-creating societies, and now rank in the top three globally.

As the success of Ontario's economic restructuring strategy took hold, the unemployment rate bottomed out at about 4 per cent on average.



In comparing unemployment levels with those of the early 1990s, it is important to recognize a few things. On the one hand, the generally higher skill levels in the workforce have significantly reduced the average period of unemployment, and in so doing, minimized as well the related negative effects on health and well-being. Extensive training is available, both within firms and for people who are between jobs. People in training of this sort are not now considered unemployed. On the other hand, many people who were on social assistance in the early 1990s have been able to re-enter the workforce. A small element of persistent long-term unemployment remains, which is a hold-over from the conditions that persisted in the 1980s and early 1990s.

These factors, in combination, have resulted in a significant reduction in poverty levels in Ontario, and an increase in economic self-reliance. Throughout the 1980s, over 6 per cent of the adult population was receiving unemployment or social assistance. This percentage rose steeply to over 10 per cent between 1989 and 1991. By 2002, we have succeeded in getting this percentage back down to less than 5 per cent.

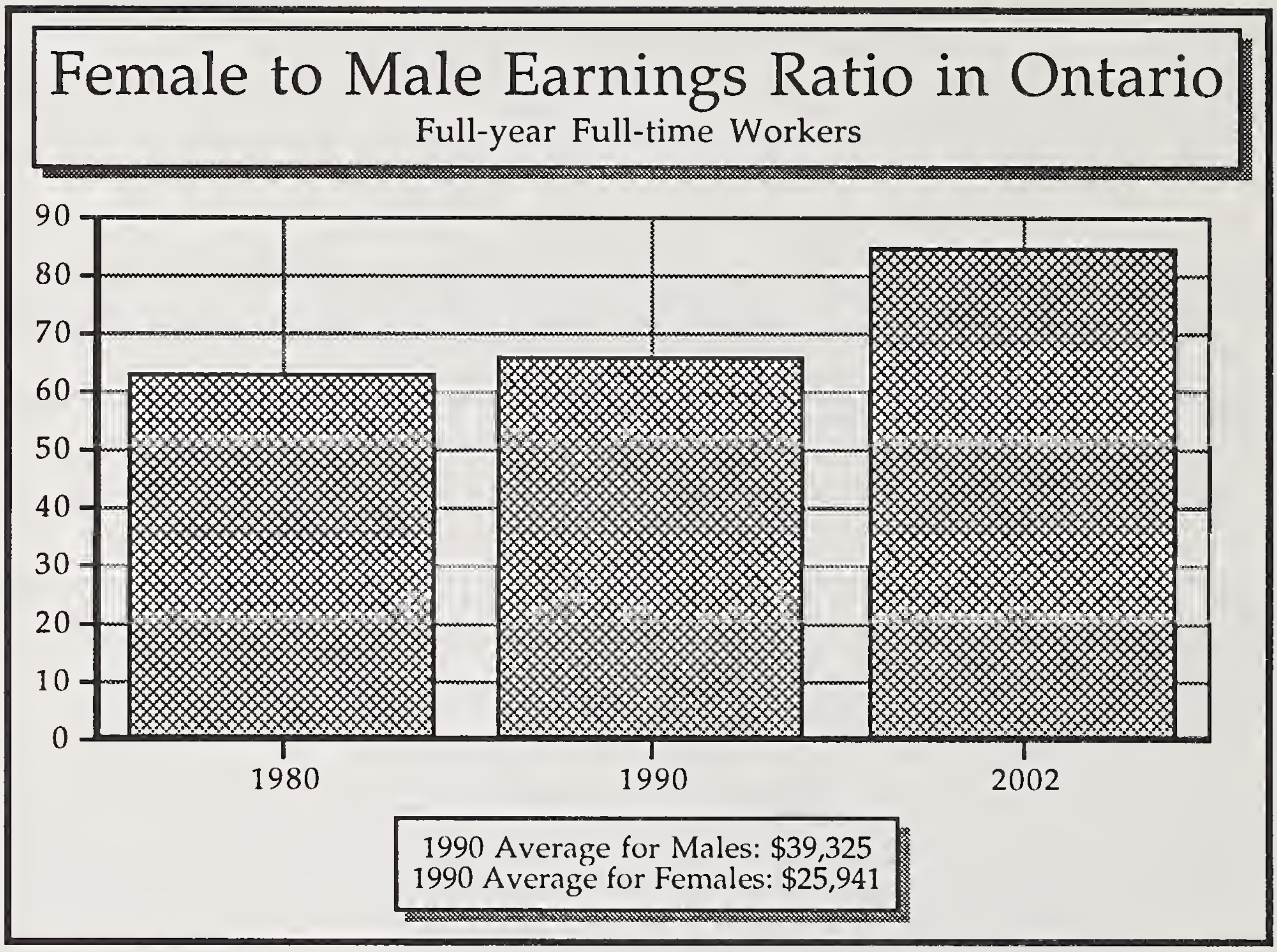


Ontario U.I. and Social Assistance Recipients

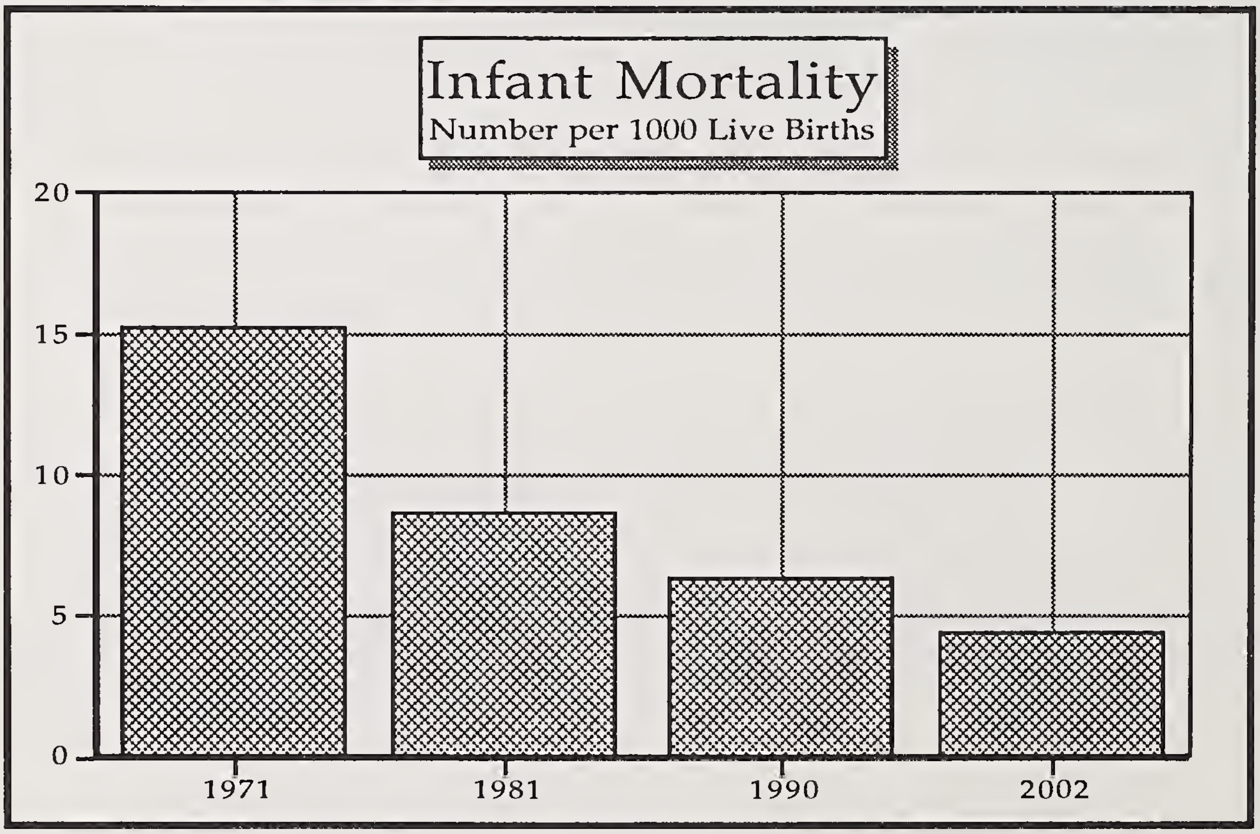
Per Cent of Population Aged 15 and Over Receiving Benefits

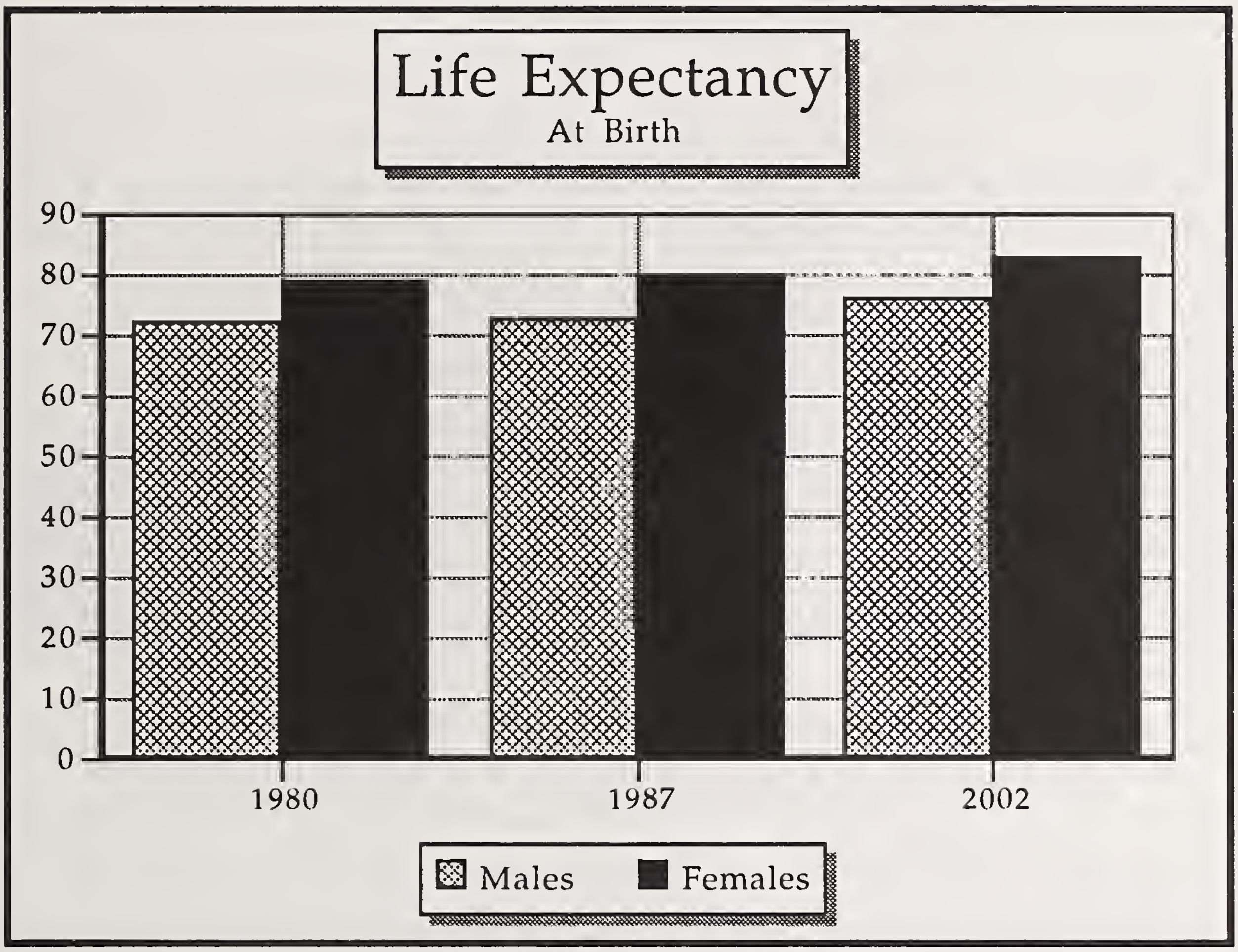
The higher levels of participation in the workforce resulting from these changes, combined with employment equity initiatives, caused a gradual improvement in income distribution patterns. Upper and middle income households continued to make gains, while lower income households improved faster, reversing the trend of the 1980s.

There was also a major improvement in the relative compensation levels of women. Overall, there remains a small gap between men's and women's incomes, due largely to a few remaining areas of lower-paying jobs where women predominate. As these women reach retirement over the next ten years, the gap will narrow considerably, and the statistics will reflect the fact that most women who entered the workforce in the 1980s and 1990s have reached full pay equity.



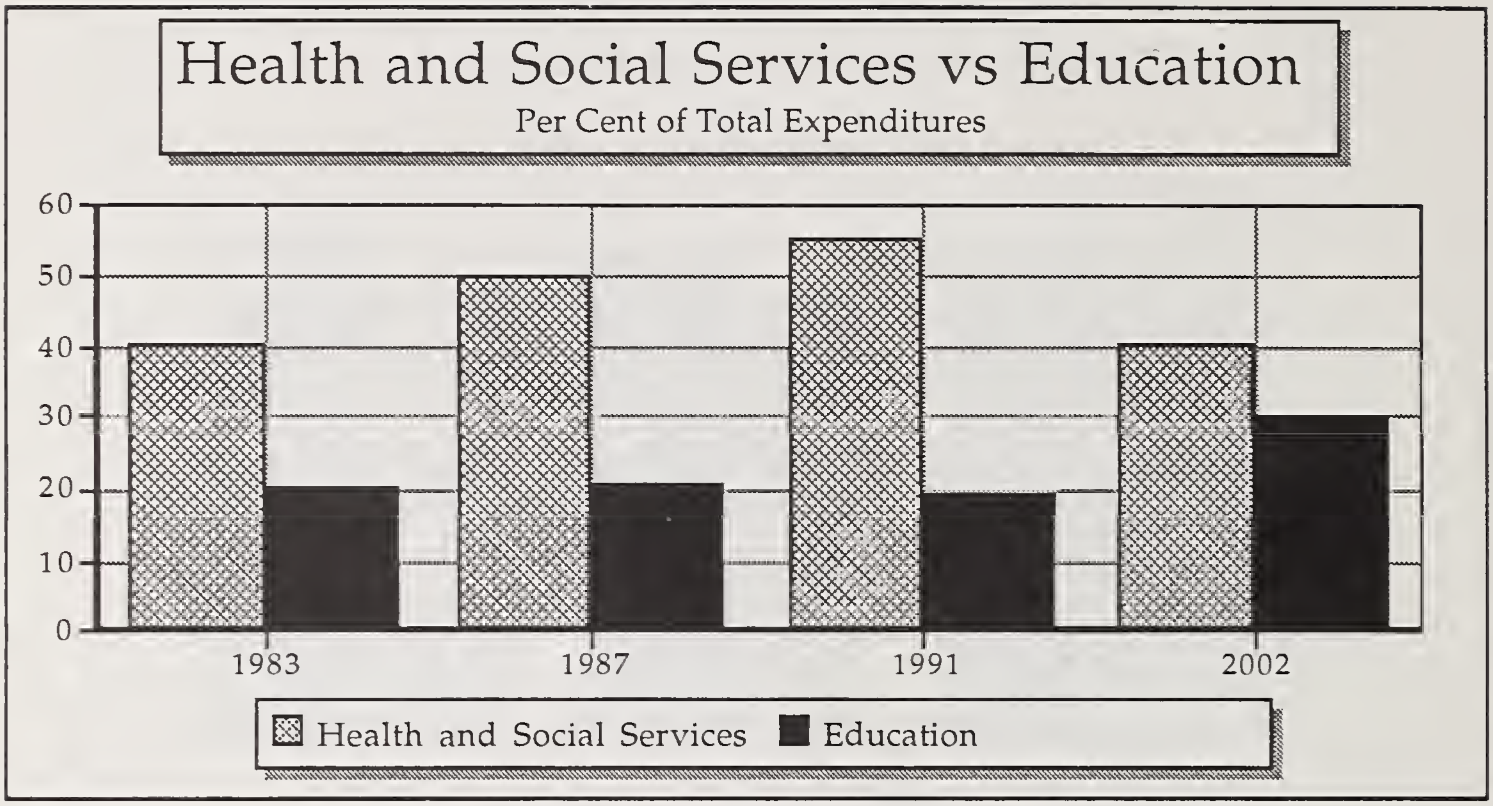
Most important, through concerted efforts we have achieved a major reduction in the number of children living in poverty. In the early 1990s, approximately one in six children were living in poverty, compared to less than one in 50 at present.





The reduction of poverty, combined with a major effort to improve the determinants of health, (which consist of one's social and physical environments, combined with one's existing biological endowment), has resulted in significant gains in health outcomes in Ontario. For example, the infant mortality rate has been reduced to less than five per 1,000 live births, which places Ontario in the top three regions worldwide. Ontario has also achieved important gains in life expectancy, which has increased for all age cohorts.

As a result of improved quality of life for the vast majority of its citizens, Ontario's crime rate has dropped. More than half of the remaining criminal activity is related to the drug trade.



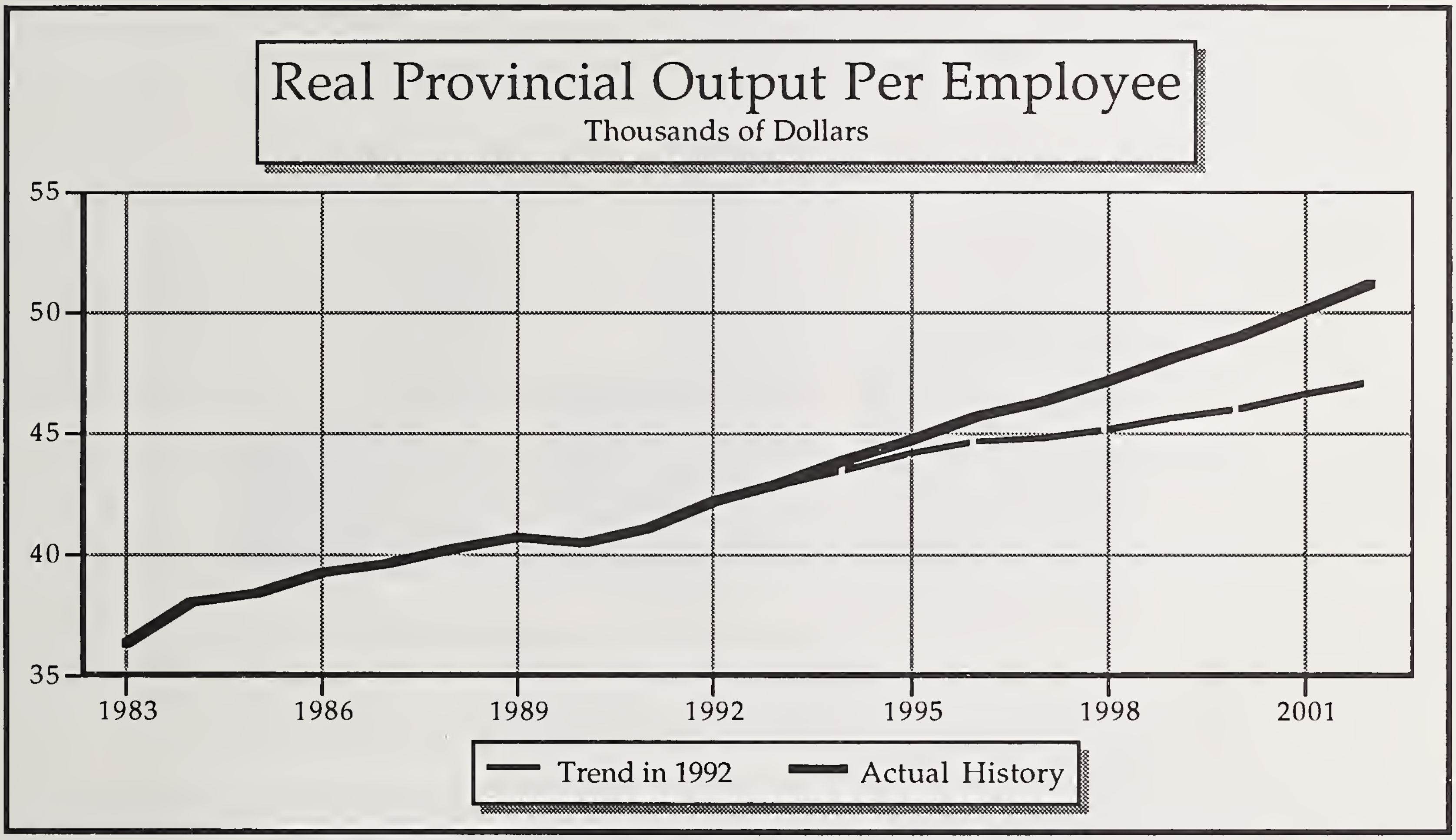
It is important to emphasize that improvements in well-being were not the result of spending more money on formal health care. In fact, the proportion of provincial revenues spent on health and social services has dropped since the early 1990s. In the case of health, this results from implementing the strategies recommended by the Premier's Council on Health Strategy of the late 1980s, coupled with steps taken by the Ministry of Health in the early 1990s to make the health care system more effective and efficient, and to place greater emphasis on improving the determinants of health. In social services, the reduced spending stems from the shift in strategy in the early 1990s from "income support" to "workplace re-entry." By contrast, the province is currently spending proportionately more money on education and training than it was in the late 1980s.

We now see that due to Ontario's superior quality of life, the "brain drain" that used to flow from Canada to the U.S. has been reversed.

The improvements in well-being were made possible by the recognition in the early 1990s of the links between wealth creation through idea-based innovation, the marketing of tradeable goods and services, and the well-being of citizens. From today's perspective, these links are clear. Almost all parts of our society recognize their reciprocal obligations, and are committed to supporting the primary wealth-creating sector. The benefits of wealth creation are distributed fairly and equitably. High quality education and training are available through all stages of human development. Our transition programs for workers are among the best in the world.

Wealth Creation

Just over a decade ago, Ontario's economy was characterized by a high percentage of businesses producing low value-added products in mature industries. The low percentage of indigenous firms was a factor in the low level of investment in research and development and the weak innovative business structure. These structural weaknesses contributed to the rash of bankruptcies, plant closings and job losses experienced in the late 1980s and early 1990s. It became evident that Ontario's economy was no longer generating the wealth required to sustain its social and physical environments.

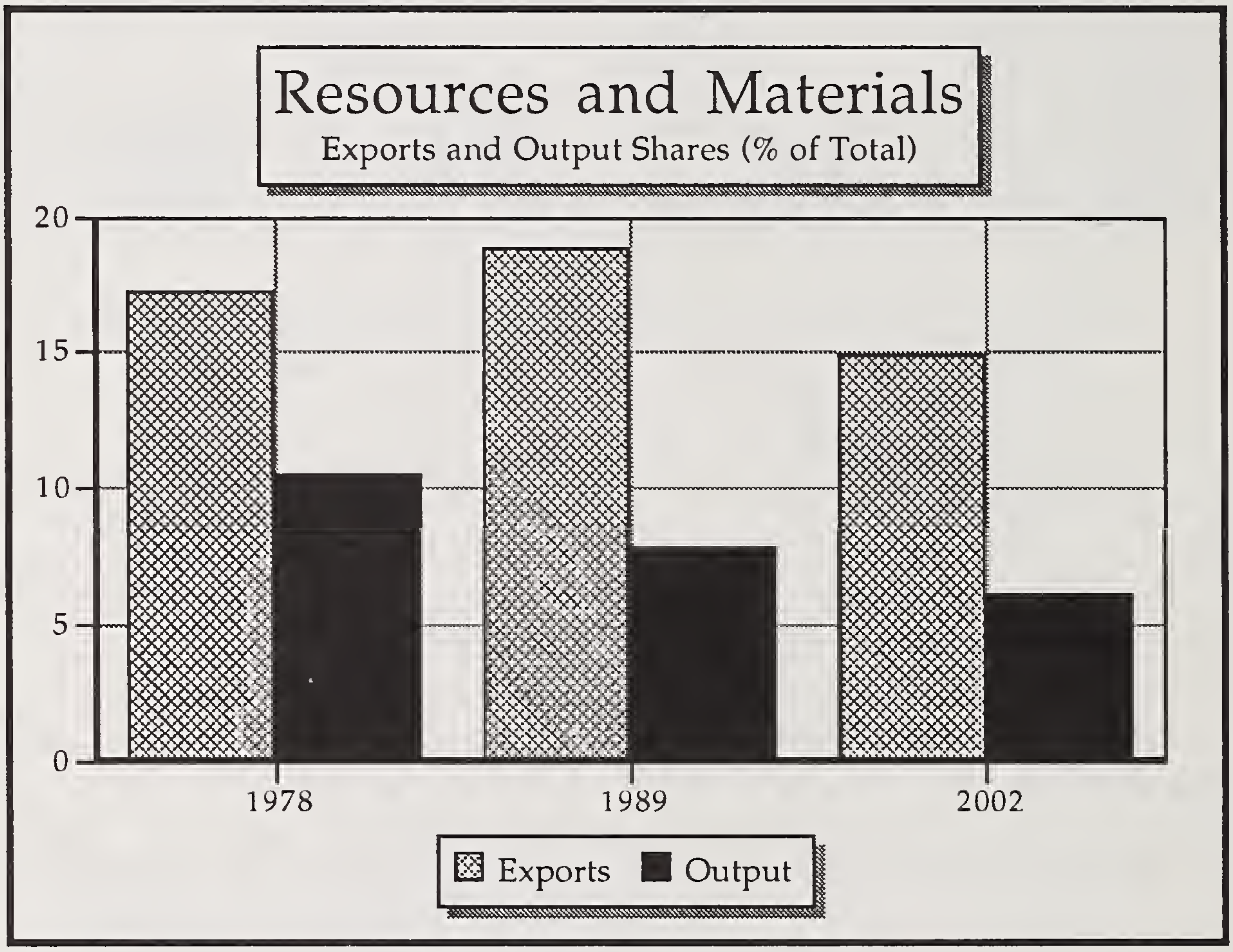


We have now overcome many of these problems. By 1995, employment in traded goods and services — the primary wealth-creating sectors in our economy — stabilized at just over 30 per cent of the workforce. While total employment in the wealth-creating sectors is down from the levels experienced in the height of the so-called boom in the 1980s, the output per employee in the primary wealth-creating sectors has increased significantly since the mid-1990s.

The increased strength of these sectors is due to two initiatives launched in the early 1990s: strategic opportunities and innovative business enterprises (IBEs). The first involved a number of specific ventures with cooperation among business, workers, government, the education and research sectors, and various communities. Some of these involved the creation of IBEs which were successful in capturing significant shares in world markets. Today, over 15 per cent of the workforce is employed within IBEs, operating from a home base in Canada.

Allow me to cite some examples of key developments in the main wealth-creating sectors of the economy.

Resource-based Commodities and Related Product and Process Technologies



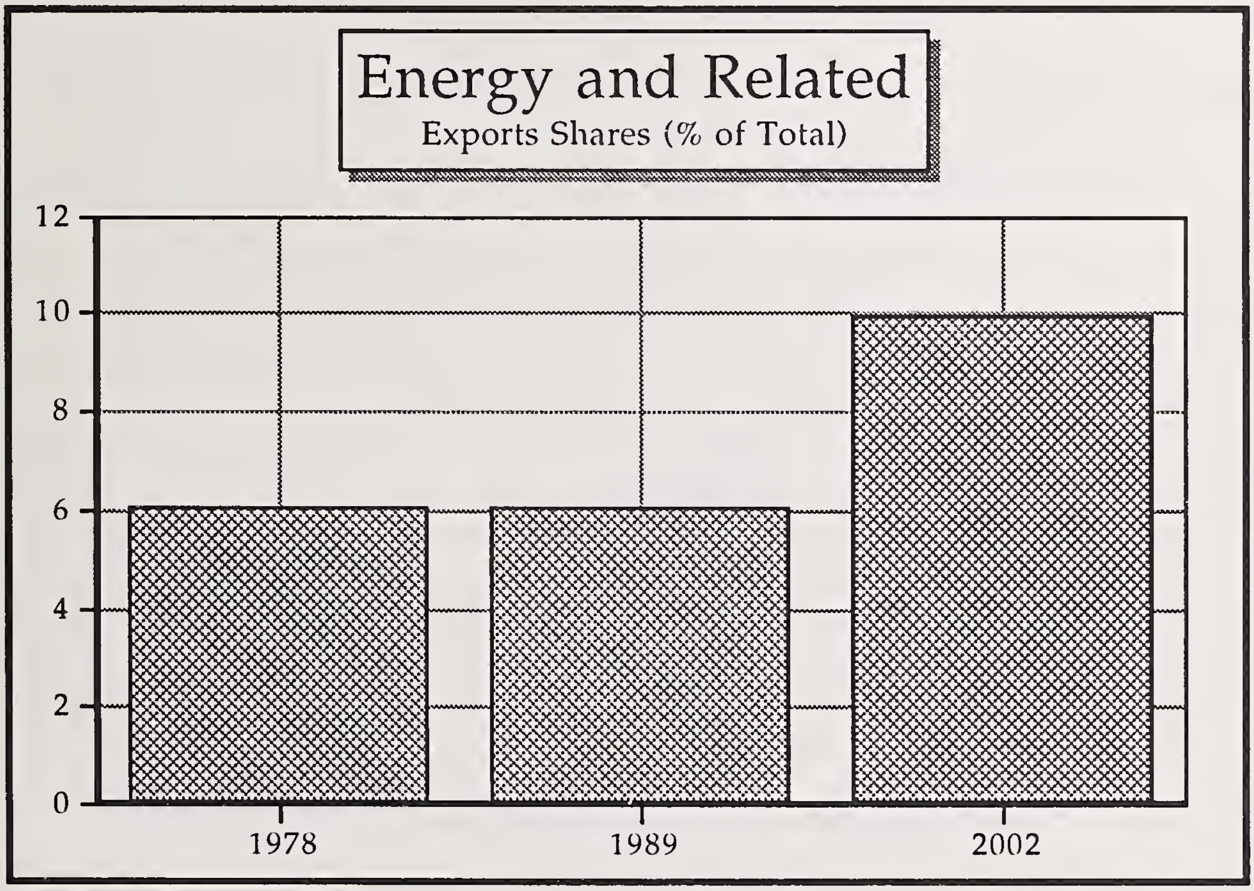
The province managed to offset the general decline in the value of exports of resource commodities by increasing the emphasis on producing higher value-added products. In addition, Ontario companies participated in collaborative projects that now enable them to export several unique technology-based products and services.

For example, a successful Canadian consortium based in Northern Ontario, building on Inco's early efforts, has developed a range of specialized mining equipment. Drawing on research in robotics and artificial intelligence, the company has developed a completely automated mining system operated entirely from the surface. In mines subject to water problems, the mines are permitted to flood since the equipment can be adapted to work in water. These techniques allow major cost savings in energy, ventilation equipment, and hoisting equipment, as well as a significant reduction in risk for the employees who formerly worked underground. These systems are being marketed worldwide.

Another venture produces equipment that is efficient at selection harvesting of trees, with minimal damage to the surrounding forest.

Yet another major development is the Canadian Materials Corporation, which we now know as CMC, an innovative business enterprise which developed out of an initial group of Ontario and other Canadian metal and steel producers, and several manufacturers of plastic, glass, and wood-based materials. CMC is now an integrated materials enterprise which works closely with the manufacturing industry. It produces custom-made materials for new and improved applications. This is a new approach, since previous industrial practice was to view the properties of a material as given. Now, through new ideas, the development of the materials themselves is integrated into the development of the end product. The breakthrough which has made such an approach possible is that CMC and a network of predominantly Ontario universities and colleges have developed a "building block" system for developing new materials which makes it possible to produce a commercial material with the desired properties in a very short time.

Energy and Related Conservation Systems



Ontario's "green industries" strategy enabled exports of energy and related conservation systems to rise from 6 per cent to 10 per cent of Ontario exports. The bulk of the increase is accounted for by a variety of energy conservation products and services, designed for both industrial and household use.

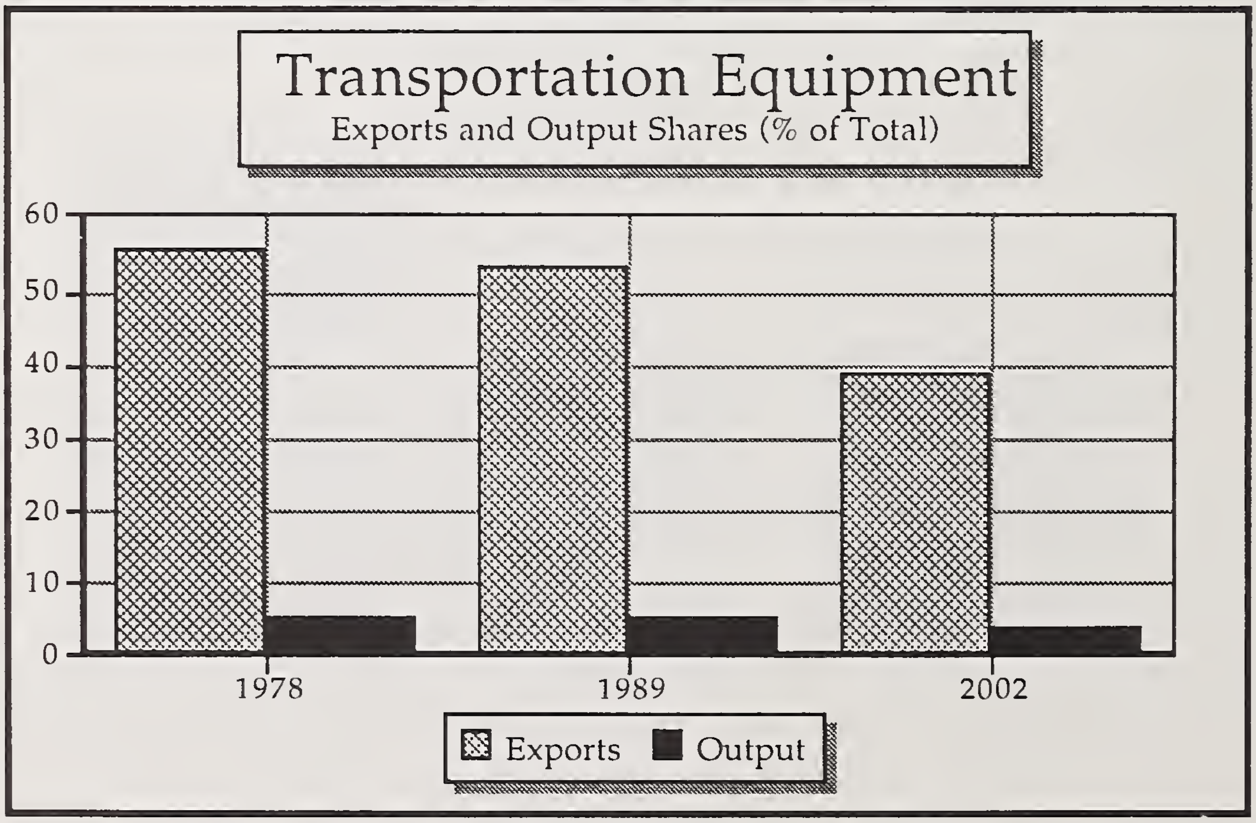
For example, Ontario industries produce and export a wide range of highly energy efficient products, including light bulbs, hot water heaters, heat pumps, microwaves, electric motors and other appliances.

A network of small and medium-sized manufacturers and contractors produces energy-saving household products for existing homes. These include windows, solar heaters, and grey-water recycling units. Many of these companies serve regional markets in the Great Lakes states.

As well, Ontario companies are part of a national consortium that produces new and effective energy systems, such as leading-edge fuel cells. These cells produce electrical power directly using hydrogen and/or natural gas, with a much higher efficiency than central generating stations, and produce only water as effluent.

Many of these developments take place within an IBE which includes an enterprise established in participation with Ontario Hydro to enable Hydro to play an active role in supporting innovation in the production and use of a variety of energy-related products and services.

Transportation



In the transportation area, the value in real terms of Ontario's exports has remained more or less constant, but Ontario's dependence on transportation exports has dropped due to the growth in importance of other sectors.

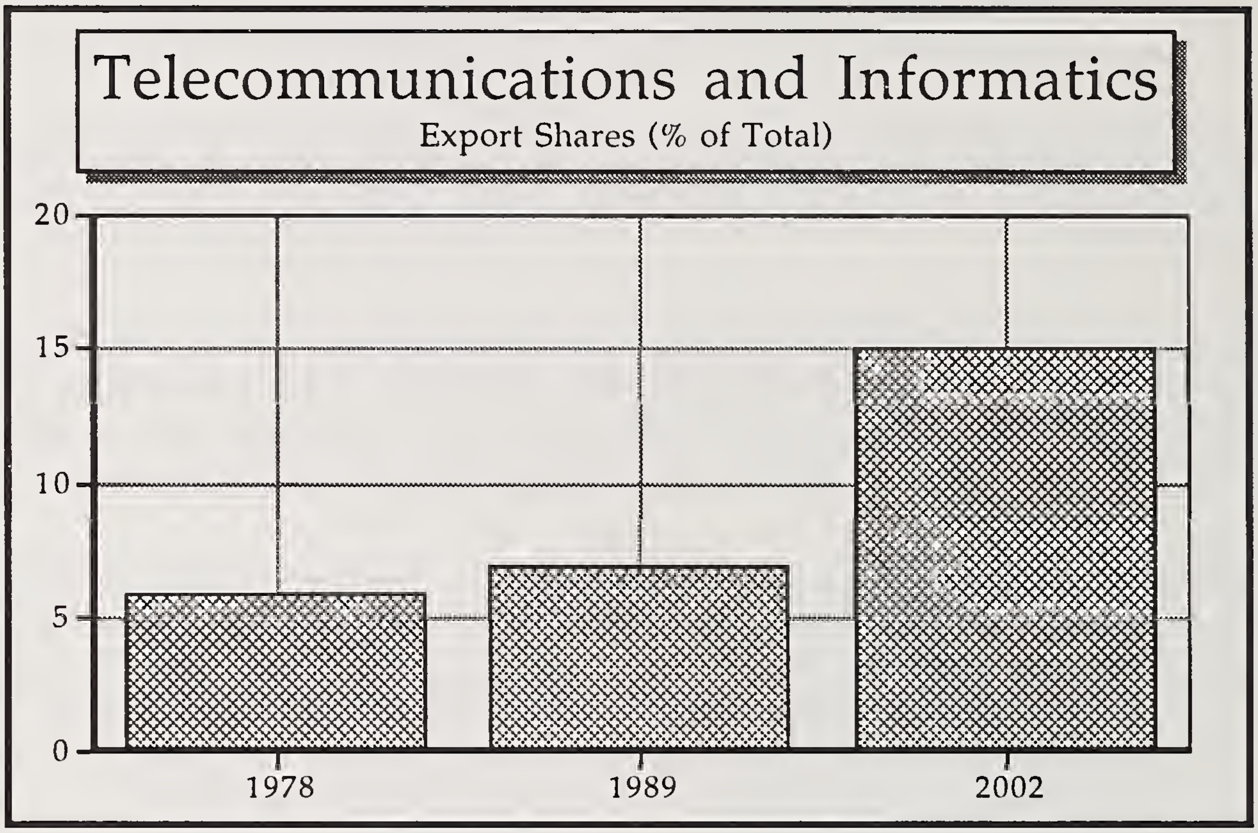
In the 1990s, Ontario continued to experience job losses related to the rationalization of the North American automotive industry. However, these losses were offset by a few key initiatives.

For example, through the IBE based around Bombardier, Ontario-based businesses participated in world markets for commuter transportation systems including rail, air, and road links which increase efficiency in rapid transportation of people and goods, while decreasing environmental impact.

In addition, several Ontario-based auto parts suppliers have developed leading edge expertise in efficient design and production of sophisticated sub-assemblies as a result of the pioneering work of the precompetitive research consortium, PRECARN, and the Centres of Excellence. The centres include the Manufacturing Research Corporation, the Information Technology Research Centre, the Telecommunications Research Institute, and the Institute for Space and Terrestrial Science. For example, in a joint venture with a large automaker, Ontario became the site for the development and production of electronic guidance systems for trucks and automobiles, and has pioneered the use of these systems on the main expressways in the Greater Toronto Area. The resulting improvements in traffic flow, fuel efficiency and safety led to the installation of similar systems in several major U.S. metropolitan centres, based on the Canadian technology. The Ontario operation of the automaker now has the world product mandate for the development of guidance devices.

Ontario has also become recognized for its contribution to the "greening" of the automobile. ORTECH International's work on natural gas carburation has resulted in a significant improvement in the fuel efficiency of the internal combustion engine. Magna International's work on electric vehicles resulted in several product mandates in Ontario. In addition, we have led in the development of designs that enable components to be more readily reused and recycled. Several of these projects have been funded by a joint Mexican-Canadian venture fund that was established in the mid-1990s by several Mexican businesses with extensive interests in the auto sector, in cooperation with several of the largest Ontario auto parts makers.

Telecommunications / Informatics / Software



Telecommunications and informatics experienced major growth in the decade, as Ontario moved aggressively to secure a position in what is now recognized as one of the largest global industries. Most of us are familiar with the main trends that became apparent in the 1990s. It is hard to think back to the time when, for example the computer, telephone, fax, TV, and VCR were different devices. In the past, hardware companies dominated the computer industry. Now, of course, most hardware is a commodity, and software is where the action is. Software used to be produced without the benefit of the standards which now permit thousands of companies to produce inter-compatible software "parts" which "plug and play" into a broad set of solutions, and have dramatically reduced the level of investment required to create innovative software products.

Ontario succeeded in this growing market due to cooperative actions, such as the development of the telecommunications strategy, taken by government, business, and other interested parties. The province had the advantage of a strong group of companies in this field, but certain issues had to be resolved for it to develop into an IBE. Building on its strengths, Ontario participates with the rest of Canada in one of the most advanced digital communication networks in the world. Communication costs are low by North American and world standards, which provides a competitive advantage for Ontario-based businesses, and makes a broad range of communications and information products and services accessible to consumers.

Ontario-based hardware and software suppliers are competitive globally. Building on successes in Mexico, Ontario-based firms have obtained a series of major contracts in Latin America, and have formed alliances with leading Latin American firms.

An information industry has developed in Ontario, revolving around the major media companies, which include system and information integrators, database suppliers, consultants, academic institutions, and government. Through joint ventures with the information industry, the Ontario government offers one of the most advanced systems of commercial, economic, societal, and environmental intelligence in the world.

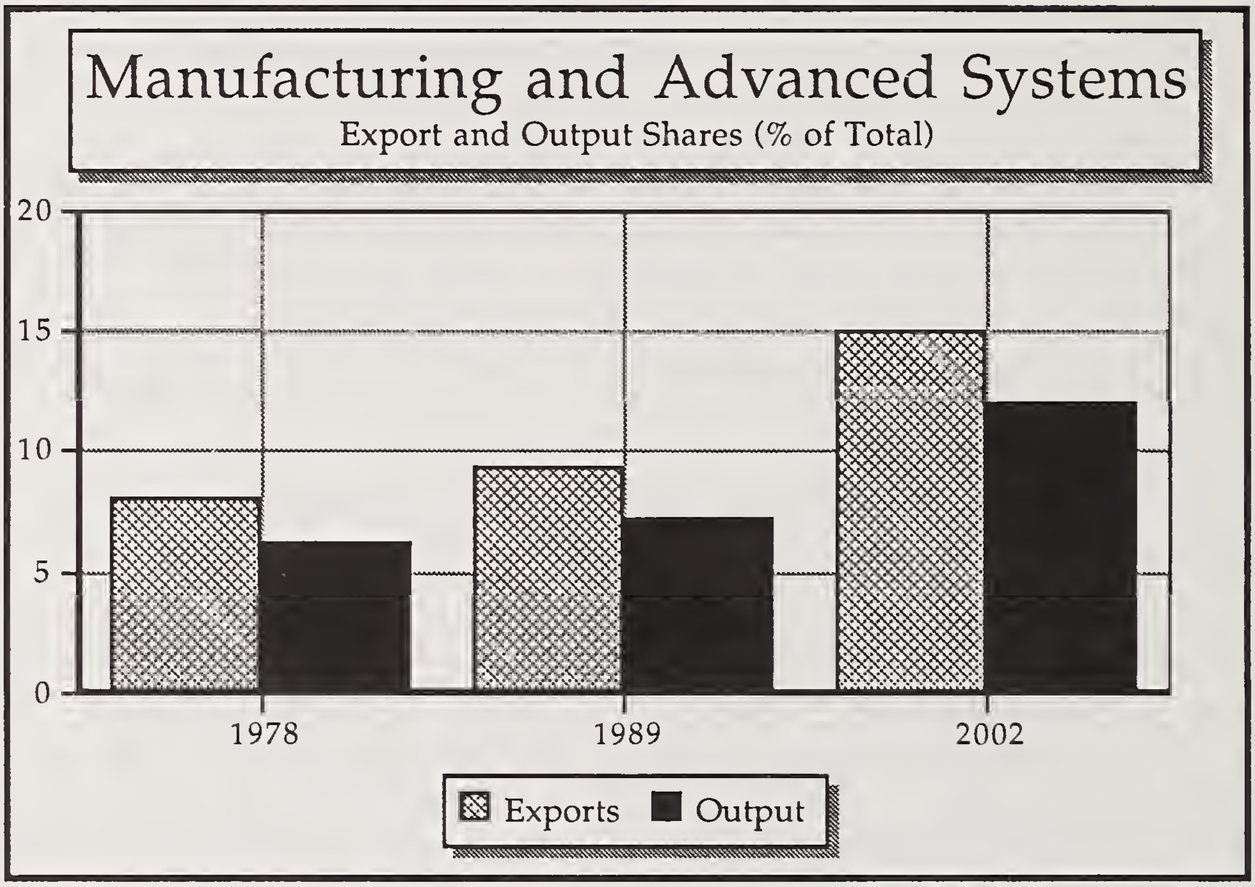
Ontario-based financial institutions provide the nucleus for one of the most advanced electronic data interchange systems in the world.

Ontario has become a world leader in the design, development and adaptation of information technology-based educational and training software and course material. The diverse language skills of our multicultural communities have facilitated the development of multilingual products for global markets. Combined with other initiatives, intelligent use of these information products has dramatically improved quality and productivity in the elementary and secondary school systems, and in Ontario's colleges and universities. Distance education is widely available to support lifelong learning. Computer-based instruction is widespread.

Ontario and several other provinces have collaborated to build a comprehensive health-related information database that monitors health trends, the efficacy of various treatments, and a system for managing health care based on outcomes. The information base and related software are in heavy demand in the U.S. and other countries that are trying to stem increases in health costs. Ontario's database is linked with the clinical databases of many pharmaceutical companies that perform clinical research in the province.

In addition, a wide variety of government services and information is available on-line in homes and workplaces. Ontario has a leading world market share in geophysical and land-use information systems. And Ontario's film and video production industries have grown significantly, based on cost advantages created by leading-edge software.

Manufacturing and Advanced Systems



While several of Ontario's traditional manufacturing industries declined during the 1990s, this was more than offset by several major new manufacturing ventures.

Ontario's decision to link part of its spending on health to economic development resulted in the creation and expansion of a variety of companies producing health-related products and services that are sold throughout the world.

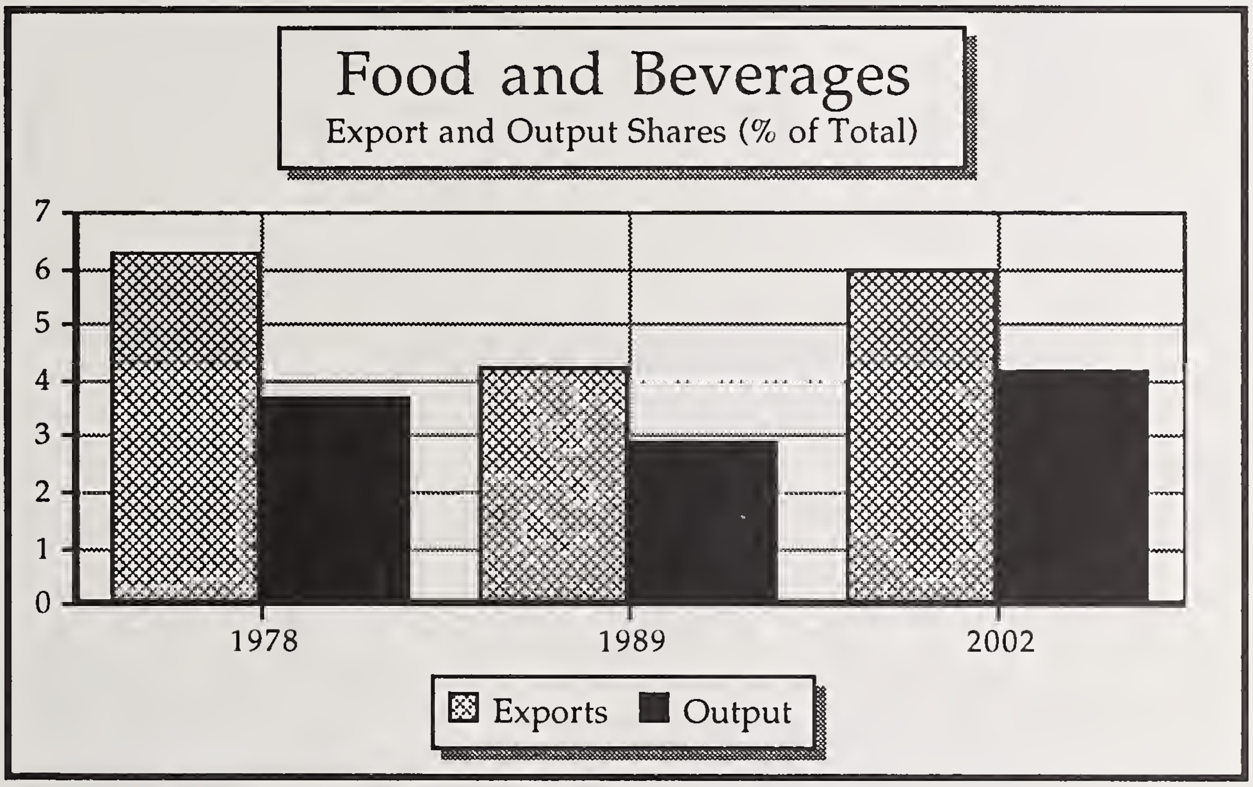
Recognizing that "smart" modular homes and buildings were on the way, the Ontario government facilitated the creation of two IBEs in this field.

It's hard for us to remember that all of our homes and offices used to have a series of stand-alone systems for heating, lighting, communications, entertainment, cooking, plumbing, and so on. The old "dumb" systems were not interconnected, could not be programmed to optimize energy use, and were inflexible.

Now, we have one IBE with a major share of the world market for the electronic components and control systems for smart buildings. The other related IBE is a Canada-wide enterprise involved in the design, manufacture and construction of advanced modular housing and commercial buildings, using wood composites, and unique manufacturing and construction techniques. The development of this industry helped to offset the continued decline of the traditional pulp and paper industry in Northern Ontario.

In addition, Ontario companies have developed a wide range of systems for recycling many products, from tires and automobiles to used engine oil and batteries.

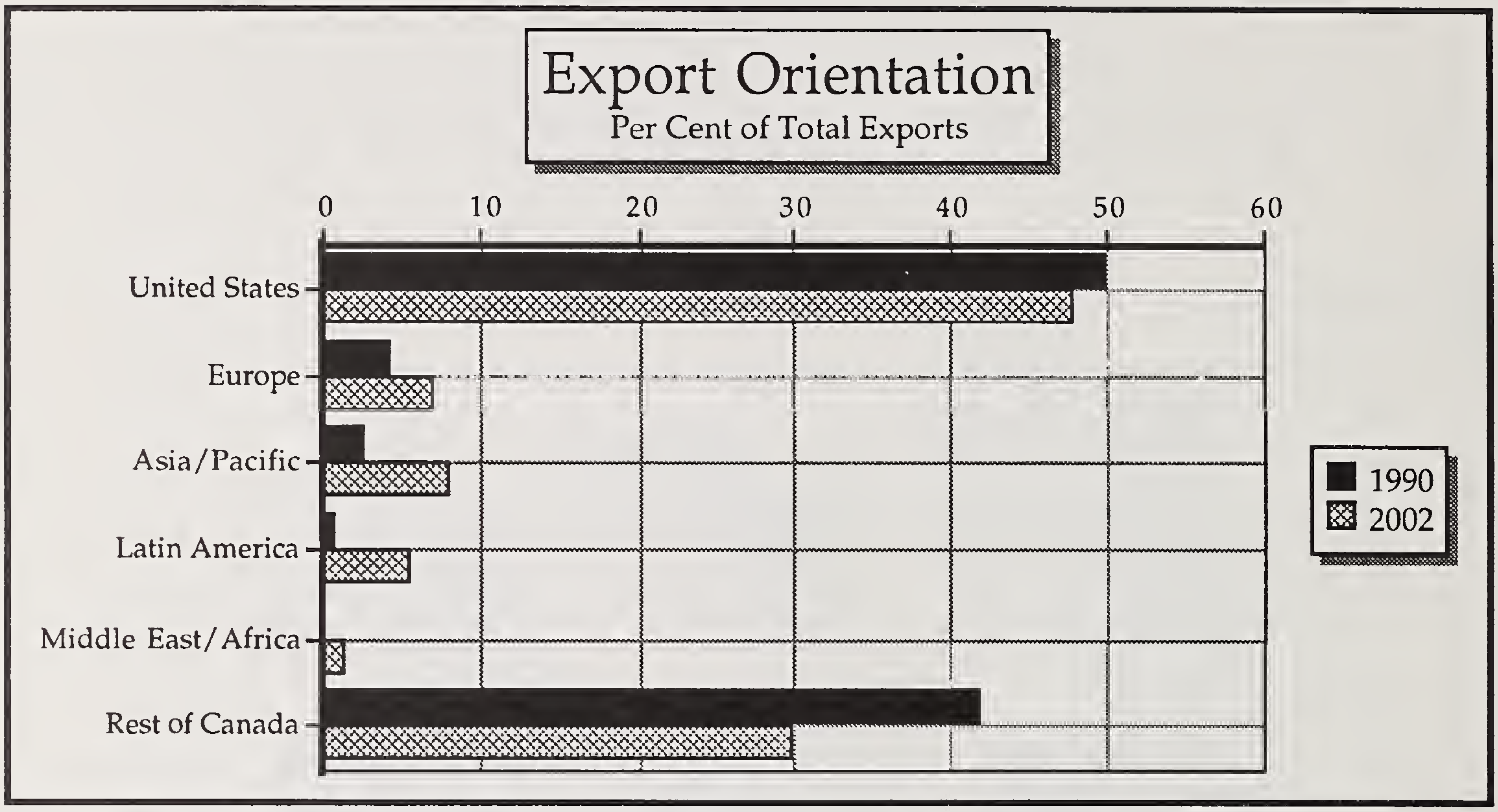
Food and Beverages

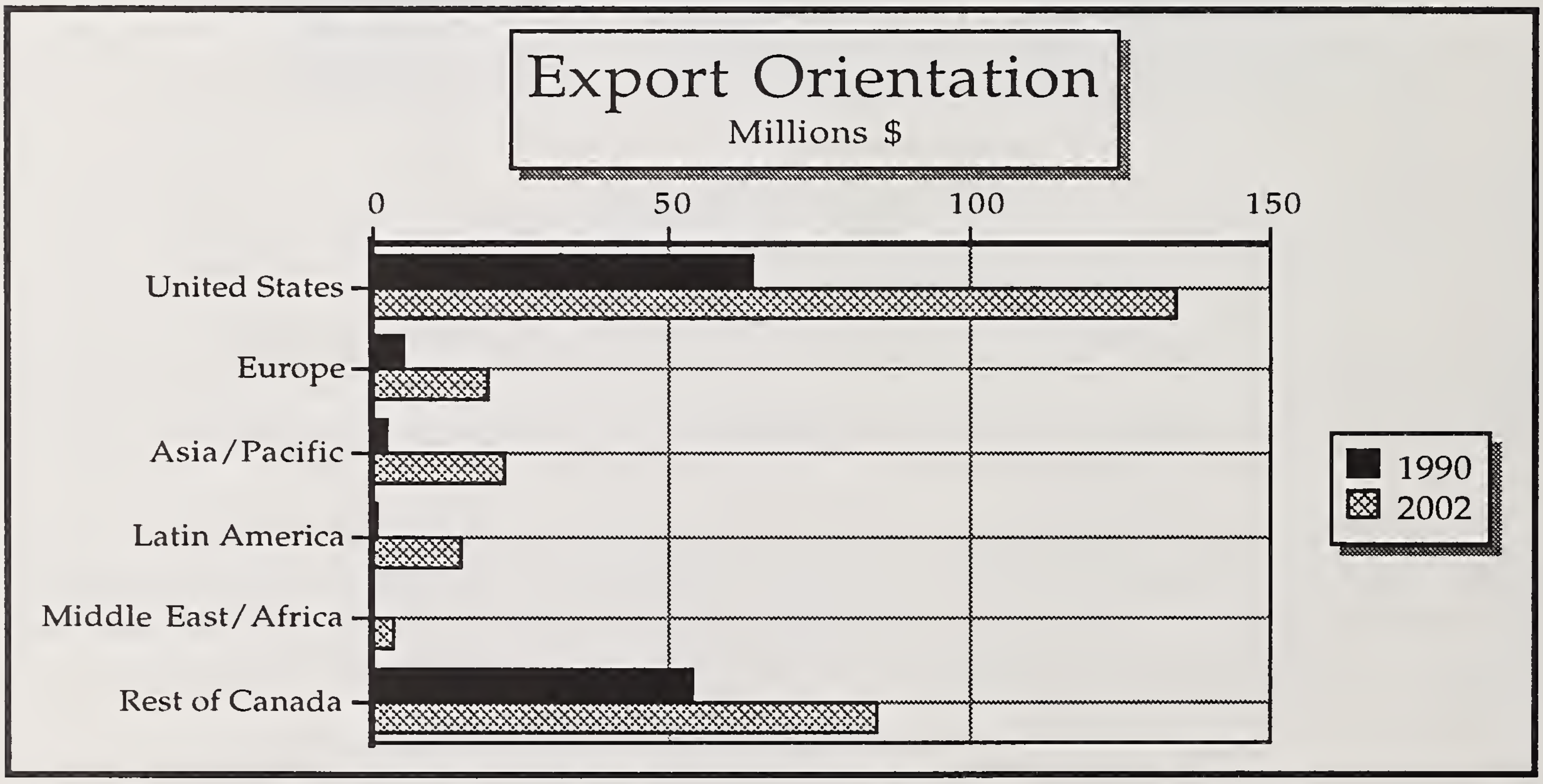


The food and beverages sector managed to reverse the decline it experienced in the 1980s, as a result of two key factors. One was the development of new value-added products by small and medium-sized ventures in communities across the province.

The other key development grew out of initiatives to create a new and distinct market identity for Ontario food products in international markets, based on the high quality of our natural environment, and on the adoption by farmers of principles of sustainable agriculture.

Geographic Diversification of Ontario's Exports



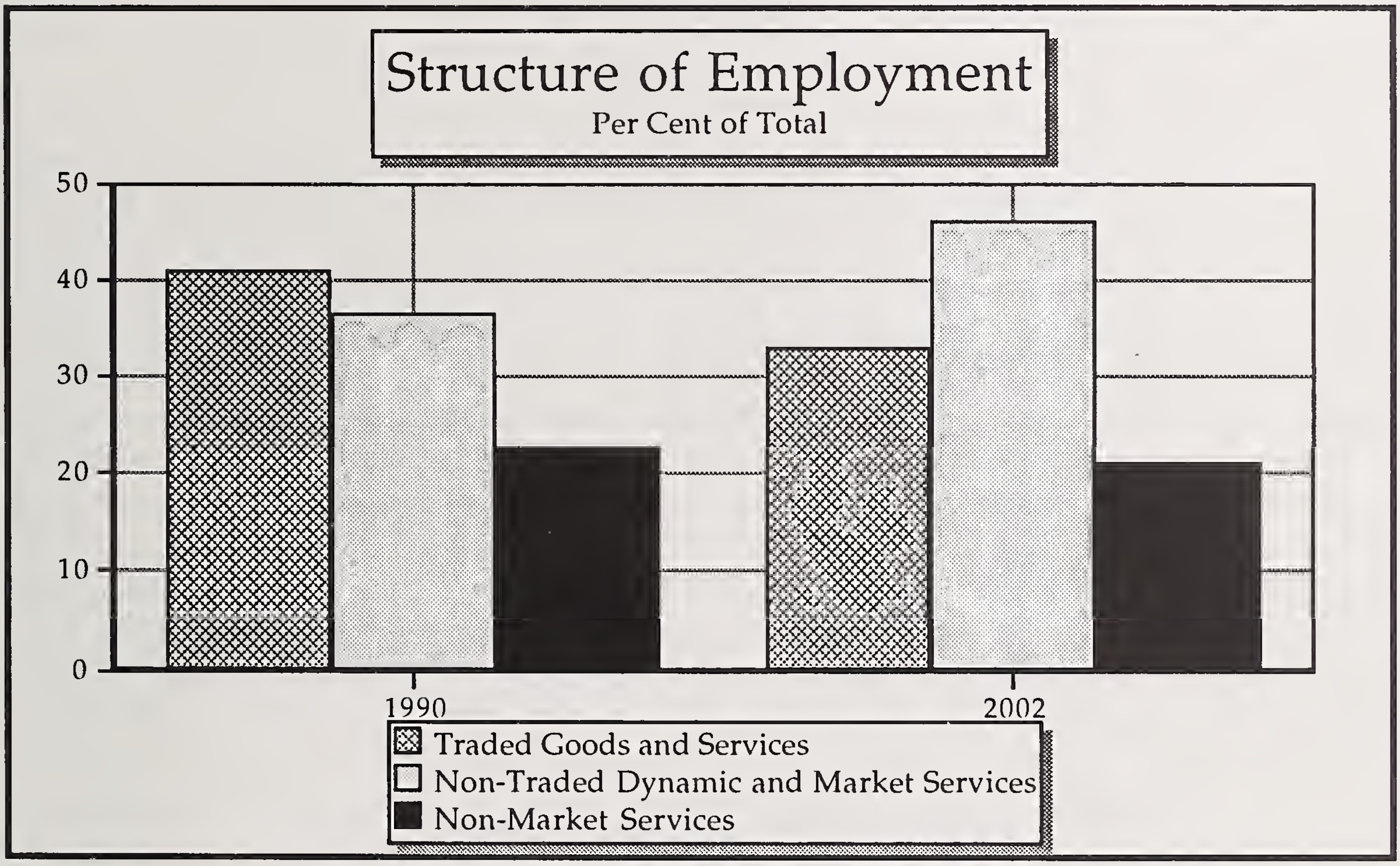


As a result of the changes I've just outlined, the geographic diversification of Ontario's exports has changed somewhat. Exports to the rest of Canada have decreased in importance. The per cent of Canadian exports going to the U.S. has decreased slightly, and the composition of those exports is less heavily weighted to the automotive sector. Exports to Europe, Asia/Pacific, and Latin America have all more than doubled since 1990.

One cause of the increase in trade with the Pacific and Latin America was that a number of leading enterprises in Taiwan, Mexico and Brazil became connected to several Ontario-based IBEs. These relationships were instrumental in building the distribution networks required to gain market share.

Some of this shift in export orientation can also be traced to Ontario's policy of attracting students from Latin America and the Pacific Rim, who are drawn by the combination of the province's dynamic economy and multicultural milieu. We also send students abroad to universities in these areas. Whether they return home or choose to stay, they contribute to stronger international ties.

The Structure of Employment



The structure of employment has changed significantly since the early 1990s. During the 1990s, the trend continued toward a branching out of the economy into much larger enterprises on the one hand, and smaller groups of entrepreneurial companies loosely tied together, on the other.

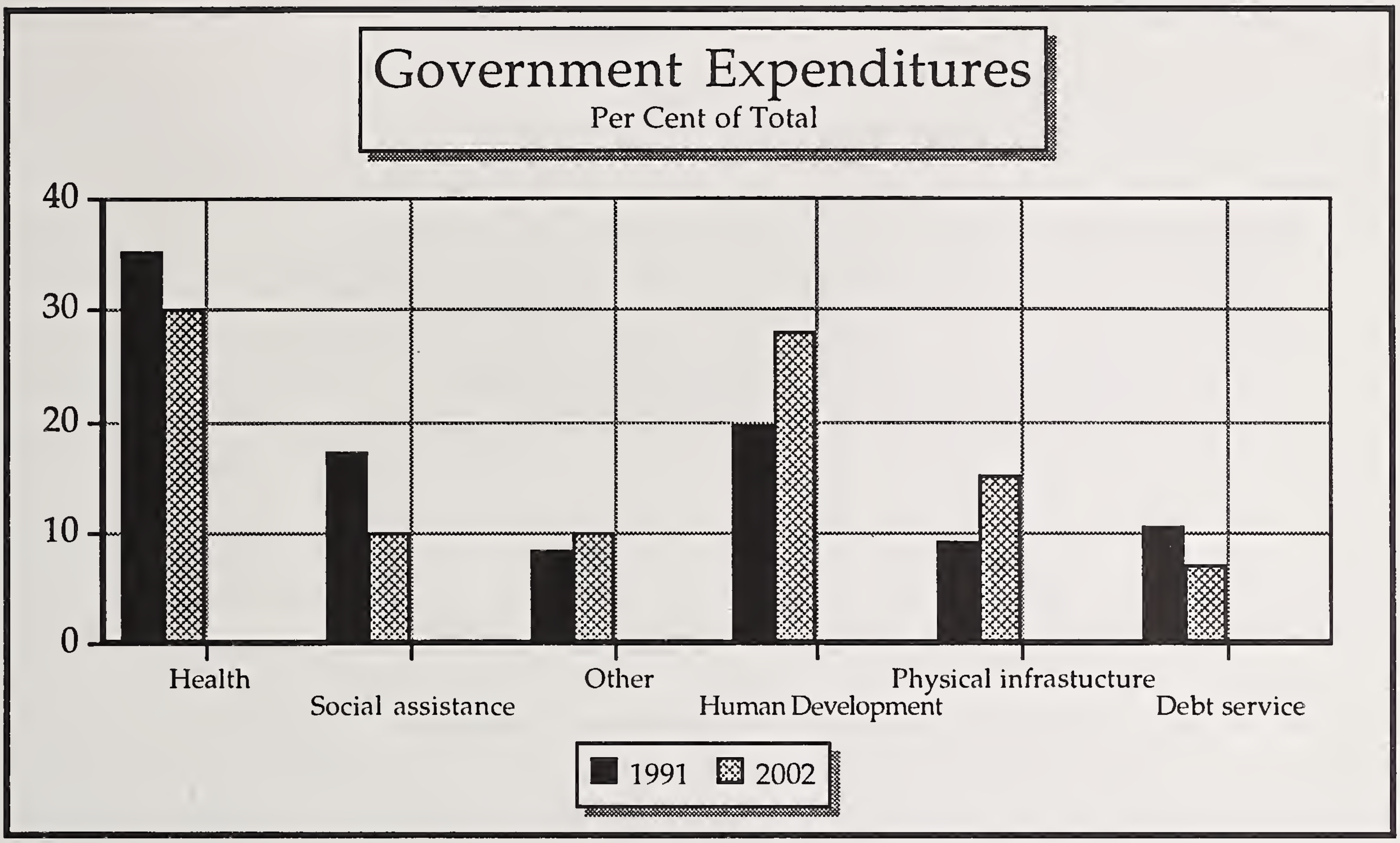
It is helpful when tracking the changing structure of employment to divide the economy into three interrelated areas.

1. Tradeable goods and services consists of the sectors that are active in international markets, either through exports, international operations, or exposure to cross-border competition. This sector is the source of primary wealth creation, in that all other areas of the economy are dependent on the wealth generated by business enterprises in this area.

2. Non-traded dynamic and market services include the business services that are primarily focused on the domestic market, and the services that are primarily oriented directly at domestic consumers, such as a large portion of retail and personal services. In areas such as business services, and leisure and cultural activities, there is the potential for some of these services to cross over into the tradeable category.

3. Non-market services include education, health care, social services, and public administration. Although these services are primarily provided by the public sectors, they provide critical infrastructural support for the tradeable sector.

As productivity and value-added improved, the share of employment in the traded goods and services sector continued to decline throughout the decade, and has stabilized at just over 30 per cent. The non-market services sector declined slightly, as a result of productivity improvements in health, education, and public administration. The increased productivity in these sectors, particularly health care, has provided a strong boost to the overall competitiveness of tradeable goods and services. The biggest change is in the dynamic and market services sector. Firstly, an increasing percentage of business services has moved into the traded category. Secondly, the general increase in wealth in our society has stimulated growth in the leisure, recreation, and cultural industries. The innovative character of these industries has led to a substantial increase in demand abroad for their products and accelerated the cross over from this category to tradeable goods and services. In general, Ontarians are healthier, enjoying themselves more, and have more time to experience cultural activities.



Taking into account all I have outlined so far, it is clear that in the last decade, Ontario has experienced a major shift in the process of becoming an innovation-based society. This required substantial public investment in people, skills, technological capabilities, and infrastructure. The investments made in support of wealth creation capacity in the mid-1990s have clearly paid off, as is evidenced by the changes in the structure of government finances. The most important trend is the reallocation of resources from the treatment of sickness and income support to investment in human development.

As a result of its economic success, Ontario is able to devote an increasing percentage of its resources to development aid. As most of you are aware, our province plays a major role in two international aid programs. One is focused on human development, with an emphasis on healthy child development, and the other is designed to assist developing countries to fast-track their approaches to economic growth through idea-based innovation and sustainable development.

New Approaches

All of these accomplishments could not have been possible without changes in attitudes towards wealth creation and in four principal areas which I will now outline:

- general institutional change
- developing codetermination
- labour-management relations
- our relationship with the natural environment

The Need for Fundamental Change

In the early 1990s, confronted with the unmistakable evidence of continued weakness in the primary wealth-creating sector of the economy, members of the Premier's Council asked a number of basic questions about our institutions. Could our leading businesses evolve in ways that would give them the critical mass to acquire a share of global markets for knowledge-intensive products and services, building on our traditional strengths in the resources? Could financial institutions and pools of capital play a stronger role in financing innovation? Could workers be empowered to make a greater contribution to the success of the enterprises in which they worked? Could governments escape the limitations of bureaucratic processes and play a more creative role in the economy? Could our investments in research be more attuned to the existing and potential technological capabilities in the primary wealth-creating sector? Could our educational institutions restructure themselves to support lifelong learning?

The answer to all these questions was "yes," but not without a fundamentally new approach to change in society. Ontario, along with much of North America, had developed one of the highest standards of living in the world through the operation of competitive and adversarial processes. However, by the 1980s, it was evident that other societies with innovative economies were achieving success by combining a greater element of cooperation with competitive and adversarial processes.

In considering the characteristics of societies with a successful track record of creating wealth through idea-based innovation, it became apparent that all of them had developed institutions through which business and government, and in many cases workers and the education and research sectors as well, codetermined their future plans, and mobilized the resources required to implement those plans.

The issue for the Council was, therefore, how to facilitate a process of change. It would preserve the positive features of competition and adversarial systems, while adding a new cooperative dynamism that would provide the impetus to overcome

Ontario's structural weaknesses, and enable it to make the transition to wealth creation through idea-based innovation.

Codetermination

To begin this change process, the Premier's Council and the government recognized the principle for codetermination.

One of the challenges in the initial stages was to agree on what codetermination is. In choosing the word "codetermination," they did not adopt any particular definition or model that may have existed elsewhere in the world. The essence of the idea is that improving our capacity to create wealth through idea-based innovation requires both a shared framework of understanding and a greater degree of coordinated action among business, government, labour, communities, and institutions than previously existed. This could not be achieved without some departure from traditional roles and institutional structures.

Given the evolving nature of the concept as applied to increasing the wealth creation capacity of the province, it was easier to reach initial agreement on what it was not. Codetermination was not consultation, which in some cases had come to refer to a process of obtaining support for policies developed by the bureaucracy. Codetermination was not simply a consensus-building process, although consensus was essential to codetermination. Codetermination was not simply an advisory process, because making progress required positive action by all participants in support of the changes needed to enhance wealth creation. In particular, codetermination was not coercion - none of the participants could be forced into the process.

One early example in which government decided to use a codetermination process was the Advisory Committee on a Telecommunications Strategy for the Province of Ontario (*Telecommunications: Enabling Ontario's Future*, Ministry of Culture and Communications, August 1992). The Advisory Committee's work demonstrated an important aspect of codetermination: given the right context, even fierce competitors in the marketplace can recognize where their self-interests are served by cooperation.

We have developed a broad range of institutions built on the principles of codetermination. They include the Premier's Council, the Centres of Excellence, the Ontario Training and Adjustment Board, the Workplace Institute (created in 1996 as a merger of the former Worker's Compensation Board and the Health and Safety Agency), various sectoral labour-management organizations, the Strategic Opportunities Fund, the Ontario Workers' Compensation Institute, and many community-based organizations.

Institutions employing codetermination can be established to deal with economy-wide issues, with issues concerning a particular sector of the economy, or with issues affecting a single workplace. But these organizations cannot be forced into existence. They are effective whenever the parties concerned recognize that their collective long-term interests are best served by developing a common framework of understanding and strategies for coordinated action.

Codetermination and Wealth Creation

Codetermination continues to be essential in building the shared vision and commitment that enabled Ontario to make the transition to wealth creation through idea-based innovation.

Key to this was long-term socio-economic investments and fundamental change in many existing institutions. It required a perspective that went beyond the term of elected governments. One of the purposes of a Premier's Council is to maintain this perspective. It can do so effectively only if it developed through a continuing process of codetermination, which recognizes reciprocal obligations among participants, including the public service.

The most frequent concern that was raised about codetermination was that it may undermine accountability, such as that of a minister to the legislature and to the people, of a manager to a board of directors and shareholders, or of a union leader to members.

Codetermination has been seen as a pragmatic approach for dealing with complex issues, in a way that enables the parties to work out solutions that serve their collective interests. Agreements reached through codetermination are subject to ratification by all participants. If codetermination doesn't work, the participants retain the option of trying a different approach.

Clearly, in a democratic society, the elected government remains the ultimate arbiter of policy. It is essential to create and maintain mechanisms which encourage citizen participation. Indeed, we have all seen how creatively designed processes of codetermination have extended and strengthened democratic involvement by citizens in decision-making.

Labour-Management Relations

Part of Ontario's success in creating a social consensus around the goals of wealth creation through idea-based innovation was the active integration of the province's workforce in the decisions and institutional innovations taken to achieve those goals.

From different directions, workers and management came to understand that developing a new relationship at both the policy making and workplace levels was an imperative. Managers realized that the skills of an involved and committed workforce were the most critical component in any innovation-driven development strategy, and that there were successful examples in competing jurisdictions which showed that unions could play a valuable role.

At the same time, changing traditional thinking to accommodate a wider and more sophisticated role for workers and their organizations required that labour organizations conceive anew their own mission. Traditional workplace advocacy remained central, but was increasingly viewed as involving much more than bargaining for a share of the pie and to protect workers from arbitrary management behaviour. Workers and unions took up the challenge of workplace reorganization and skills development, and in some cases even developed their own models for corporate restructuring, incorporating the goals of wealth creation through idea-based innovation with empowered workers.

Moving beyond the institutionalized adversarialism of the previous era toward more consensual and participatory mechanisms was not accomplished easily, as it required both management and workers to take the risk of experimenting with new roles. These experiments continue, in the workplace, within IBEs, within industry-specific joint labour-management organizations, and within our leading institutions for codetermination.

In the workplace, people are experimenting with various models for the organization of work, and with different ways that companies, individual workers, and unions can contribute to the capacity to innovate. The creation of IBEs provided an additional impetus for such experiments, particularly in the area of new roles for organized labour.

At the level of particular industries, we now have a wide variety of sectoral agencies that are heavily involved in skills training, assistance to workers in transition, and initiatives to improve innovative capacity within the sector. These developments can be traced to a variety of joint worker-management initiatives created in the recession of the early 1990s.

At the provincial level, our institutions for codetermination continue to evolve.

It is important to note that the labour movement found it could support the initiatives taken in the early 1990s to create IBEs and to develop strategic opportunities through a process of codetermination for two reasons. First, because the labour movement's own thinking evolved, and second, because the response of the business community was positive. Labour also saw this realignment in the province's approach to economic development as constituting a deepening and expansion of popular democracy.

The opportunity for working people to have more control over their personal growth by developing their skills in appropriate ways, and to have a more meaningful role in decision-making in their place of work strengthened consensus, and restored the social efficacy that was in danger of being lost in the 1980s and early 1990s. At the time, many in the labour movement feared that we were heading in the direction of growing inequality and declining public goods, within a society characterized by divisiveness, ennui, and self-destructiveness. Fortunately, the evidence shows that we have been able to chart a different course.

The Natural Environment

Turning to our new relationship with the environment, I'd like to summarize briefly what we've achieved in the last decade in this area. In the late 1980s, following on the heels of the United Nations World Commission on Environment and Development, Ontario, along with other provinces, set up multi-sectoral, consensus-seeking bodies known as round tables. As requested by the Premier of each province, the job of these round tables was to suggest strategies for achieving long-term, sustainable development.

In September, 1992, three and a half years after its founding, the Ontario Round Table on Environment and Economy presented the province's first sustainable development strategy. The Round Table employed a new consensus-building, codetermination process which led to the integration of policy formulation across several fields including, but not limited to, economic development and the environment. The partnerships that were established through the Round Table strengthened links and began to change the process from the traditional hierarchical government decision-making process, into one involving consensus building.

Recognizing that a whole new set of indicators was needed in order to measure progress toward a sustainable society, the Round Table called for the development of a set of hybrid indicators (combining environmental, economic, and social factors) as part of a new information gathering and reporting network for the province. Based on these recommendations, Ontario began work to develop the system we now have.

It measures human well-being, assesses human-induced stress on the environment, diagnoses ecosystem well-being, and provides management indicators on the performance of ecological and economic systems.

These measures have had a profound effect on our behaviour as a society in relation to the natural environment. The ethic of sustainable development influences decision-making throughout our society. Over the past decade, while our economy has grown significantly, our use of energy, water, and materials has declined in absolute terms. Ontario is a world leader in the use of market incentives to stimulate improvement in environmental standards — which are now seen as essential to the health of the economy.

As a result of this activity, we have, in the past few years, begun to record improvements in air and water quality throughout the province. The waste stream going into landfill has been reduced by 75 per cent from the levels of a decade ago. Ontario produces equipment for recycling a host of products. We use this equipment ourselves, and sell it around the world.

Remaining Issues and Future Priorities

In outlining our achievements at some length, I don't mean to minimize the issues still confronting us today. A small but important percentage of Ontario residents do not enjoy the benefits that most do. There are continuing regional disparities that we have not yet resolved, and perhaps cannot resolve. Continuing growth in the Greater Toronto Area continues to challenge our ability to keep it a liveable metropolis. We have not yet been able to exploit the full potential of the emerging IBE structures on the economies of the different regions in the provinces. We still contend with a number of long-term environmental problems whose solutions will be expensive. As the "baby boomers" from the 1950s begin to retire in significant numbers, we will have to strengthen our efforts to create the wealth required to enable our society to maintain its prosperity while supporting a large elderly population. This development may bring new opportunities, as elders in large numbers might be available to play a much larger role in the institutions that promote healthy child development. Finally, we have only begun to scratch the surface in our efforts to help other jurisdictions accelerate their development as wealth-creating societies.

But before we begin setting priorities related to these and other issues, I would like to remind you of the main initiatives in the 1990s that enabled us to enhance our wealth creation capacity as a society, enhance well-being, and make the transition to sustainable development.

3. 2002 - How We Got There

This section continues the Premier's address, focusing on the developments leading to the future described in the preceding section.

From our perspective in 2002, it's hard to capture the disorientation and anxiety for the future that most Ontarians felt in the late 1980s and early 1990s. After a period of apparently strong economic growth in the mid-1980s, fuelled in part by public and private sector borrowing, the economy seemed to suddenly collapse. A string of layoffs, plant closings and bankruptcies drove the unemployment rate from just over 5 per cent in 1989 to over 11 per cent by 1992. Adjustment to the Free Trade Agreement, high real interest rates, a relatively high Canadian dollar, and a worldwide recession combined to create extremely difficult business conditions. Twelve years ago, Ontarians woke up to find they had elected, for the first time in history, a social democratic government. Almost overnight, it seemed, the provincial finances moved from a surplus in 1989-90 to a deficit of almost $10 billion by 1991-92. When the Premier asked his rhetorical question, "What do we owe each other?" the answer was, "More and more each day." To top it all off, Canada seemed to be on the verge of breaking up.

Most Ontarians recognized that the economic difficulties were not simply the result of a cyclical recession. There was a general acceptance that Ontario faced some basic choices about its future. Some felt that Ontario, and Canada, had no choice but to harmonize our socio-economic approach with that of the United States, given the increasing integration of the North American economies. While many others passionately defended Canada's traditional social programs, the fiscal pressures of massive federal and provincial deficits demonstrated that the status quo was not viable. Canada's and Ontario's economies were not creating the wealth required to sustain our social and physical environments and maintain a commitment to national sovereignty, let alone making the improvements in individual well-being many thought were overdue.

As we now know, Ontario chose the path of enhancing its ability to create wealth through idea-based innovation as the only viable way to maintain and enhance its prosperity and social and physical environments. We can now see that the single most important development enabling this choice was the evolution of a set of institutions for codetermination. From today's perspective, it is hard for us to imagine how the economy worked without the close cooperation that now exists among business, workers, government, the education and research sectors, and communities. We can trace the roots of many of our current institutions for codetermination to the establishment by Premier David Peterson in 1986 of the original Premier's Council, and the creation of the Technology Fund, as it was then called.

There were many previous initiatives in Canada that promoted cooperation between business and labour, between business and government, and between business and the education and research sectors. However, at the time it was established, the Premier's Council was unique in Canada. It was the first time that all of these groups had been brought together in one body chaired by a premier, and with a broad mandate and the resources to undertake a significant program of investigation. Equally important was the role the Council was given in providing strategic direction to the development of the Technology Fund programs.

Developing the Technology Fund

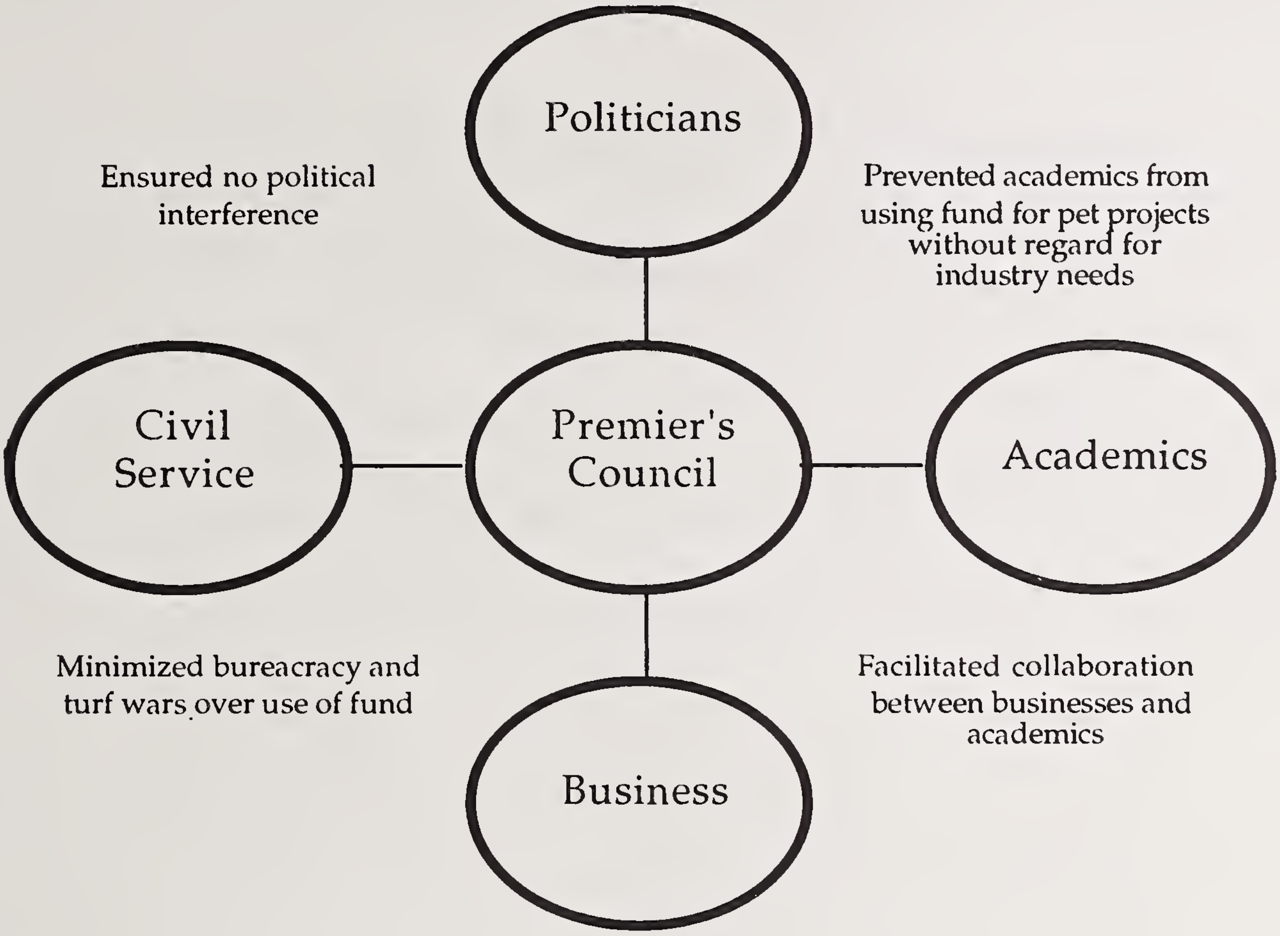
The Technology Fund was created in response to the need to accelerate the pace of innovation in Ontario's economy. The original objectives of the Technology Fund were:

- to help companies develop, obtain, and use the best science and technology available for new products and processes;
- to support the export of advanced technology goods and services, and reduce the technology trade deficit;
- to ensure a supply of highly qualified personnel for industry in strategic areas;
- and to contribute to the creation of a science and technology culture in Ontario.

There were some important precedents set in the development and implementation of the Technology Fund. The basic concepts and broad policies for the Fund were developed within the Premier's Council. The Fund was administered by public servants in collaboration with the Council, but the private sector was heavily involved in bringing the programs into being. The Tech Fund was structured as a program of the government, not of a particular ministry. In all, more than 2,000 individuals from the public and private sectors were involved in the evolution of the Technology Fund over its first five years. Many thousands more benefitted from Tech Fund programs.

Involving the Premier's Council in this way enabled the Tech Fund to avoid some of the traps many R&D programs fall into. The involvement of the Council meant that narrow political considerations would not affect funding decisions. Bureaucracy was kept to a minimum, and, from time to time, the Council was able to provide advice to the Premier that enabled him to nip in the bud turf wars over the Fund. The Fund was not to be used by academics to fund their pet projects. The process required that academic institutions and business work closely together.

Unique Features of Technology Fund Development and Implementation


Politicians
Ensured no political interference
Prevented academics from using fund for pet projects without regard for industry needs
Civil Service
Premier's Council
Academics
Minimized bureacracy and turf wars over use of fund
Facilitated collaboration between businesses and academics
Business

The achievements of the Technology Fund and its major programs were impressive. However, in the early 1990s, it was apparent that the Technology Fund was not enough to bring about the changes required for Ontario to become an innovation-based society. As the Premier's Council on Economic Renewal worked on these issues in 1991 and 1992, it realized that fundamental changes in institutional structures were required if investments such as the Tech Fund were to have an impact.

Strategic Goals for Ontario[2]

One of the early steps which laid the groundwork for the expansion of codetermination was the participation by the Premier's Council on Economic Renewal, the Premier's Council on Health, Well-being and Social Justice, and the Round Table on Environment and Economy, in a process aimed at developing a set of strategic goals for the province.

From an economic perspective, the initial emphasis was to develop a set of strategic goals to position Ontario within the North American economy. However, it quickly became apparent that developing an integrated set of strategic goals relating to wealth creation, individual well-being, and the natural environment, was critical to broadening the understanding of the interdependencies among these objectives.

I will outline for you the initial set of goals which were adopted by the three main codetermination bodies, the two Councils and the Round Table. It is important to emphasize that these were goals for the province as a society, and not goals for the government, which had a narrower agenda. As I present these slides, you will note that we have now achieved most of the goals we set for ourselves.

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[2] The process of developing these goals was underway in 1992. The examples listed here are not the result of this process.

Wealth Creation

By 2002, Ontario developed a number of areas of recognized competitive advantage:

- The best educated workforce in North America;
- The best technological capabilities in the world in selected niches, based on effective links between publicly funded institutions, public-private partnerships, and businesses in the private sector;
- The most effective and efficient public sector in North America;
- The best productivity growth in North America, achieved through rapid diffusion of advanced technologies, empowerment of workers, enlightened labour-management relations, and innovative workplace organization.

By 2002, Ontario is recognized as competitive with other jurisdictions around the world in the following areas:

- Physical infrastructure, including transportation;
- Operating costs for business;
- Reliable energy;
- Availability and cost of capital for financing all components of innovation;
- All forms of taxation.

By 2002, Ontario is recognized as having developed an innovation-based society, which generates the highest value-added products and services in North America, as a result of the following:

- A majority of economic activity in growing — not mature or declining — industries;
- At least six innovative business enterprises with significant shares of global markets operating out of a base in Ontario;
- New institutional structures support the ability of small- and medium-sized businesses to compete effectively in market niches around the world;
- Ontario-based traded service businesses compete effectively in international markets.

Well-being

Ontario is recognized as offering a quality of life which is among the best in the world, achieved by applying a process of continuous improvement in the following areas:

- Best population health outcomes, combined with the most effective and efficient system of universal health care in North America;
- An equitable society, measured by progressive reduction of poverty, effective mechanisms for labour adjustment, progressive elimination of all forms of discrimination that result in perpetuation of inequality, and a continual reduction in the percentage of the population that is dependent on social assistance;
- Greater emphasis throughout society on human development, with particular focus on healthy child development, resulting in higher scholastic achievement, and less antisocial behaviour;
- A healthy and developing culture, measured by cultivation of the arts throughout the province;
- A shrinking crime rate and sensible urban development;
- Income distribution that rewards accomplishment but does not undermine the basis for cooperation within society;
- Active involvement of citizens in society, involving greater social participation, measured by voter turn out rates and community voluntarism.

Approaches to achieving all of the above are based on understanding the underlying determinants of health and well-being in society, which enables the reduction of social expenditures for current consumption, and the increase of social expenditures for investment.

The Environment

Ontario is recognized as a world leader in implementing sustainable development, through:

- Implementation of efficiency-creating high performance standards;
- Development of a set of comprehensive benchmarks to enable improved accountability for public and private decision makers;
- Acceptance by business enterprises of "cradle to grave" responsibility for their products, involving "design for reusability", and shared responsibility for reduction, recycling and reuse;
- Use of public-private partnerships to develop a recognized position in world markets for leading-edge technologies and expertise in areas such as waste treatment, handling hazardous materials, recycling, and environmental remediation
- Achieving further improvements in air and water quality throughout the province;
- Working in partnership with jurisdictions in the developing world to accelerate the implementation of sustainable development on a worldwide basis.

This first set of strategic goals was initially only a hypothesis. It wasn't clear whether they were the right goals, or whether they were achievable. Over the months following their development, analysis was conducted to determine whether the goals were realistic in relation to the actual position of Ontario in the North American economy, and whether they were compatible with the strategies of potential IBEs in the province. Over time, comprehensive comparisons were made with other jurisdictions, and progress was monitored against these benchmarks. The goals were revised periodically, along with the action plans required to achieve them.

While development of the strategic goals played an extremely useful role in generating a common purpose and direction, the goals in themselves would not create change. In 1992/93, several processes created a renewed sense of momentum and optimism in the province. Some of these were initiated by the Premier's Council on Economic Renewal, with the private sector and government.

Immediate Actions to Encourage Investment

While the strategic goals were being developed, the government took action to ensure that Ontario was recognized as a favourable investment location in North America. These included the establishment of a new approach to investment marketing and retention, and regulatory changes to speed up the government approval process. These and several other initiatives succeeded in convincing the private sector that Ontario was an aggressive competitor for investment in North America.

Strategic Opportunities for Ontario

Looking toward the longer term, the Council recognized that there were numerous areas where coordinated action by business, government, workers, researchers, and communities could generate new wealth creation opportunities. The pace of development in information technology, materials technology, and biotechnology was such that most existing businesses in Ontario were unable to exploit their potential to transform their businesses. In many cases, entrepreneurs had been able to exploit some opportunities, but frequently the effort to develop their potential fully required more resources than individual Ontario-based businesses could secure. Unlike societies in Europe or Japan, Ontario was not accustomed to major joint projects of this type.

To help explore these opportunities, the Council developed an initial list of strategic opportunities and enabling technologies, and set up a Strategic Opportunities Task Force to carry the process forward. The main responsibility of the Task Force was to design and implement an approach that would enable the development of initiatives led by the private sector, and to avoid a government-driven approach. The Task Force set up a working group focused on each opportunity. Each group included representatives from interested businesses, financial institutions, labour, government, the education and research sectors, the federal government, and communities. The job of each working group was, over the period of about one year, to:

- Evaluate the market potential
- Identify Ontario's relevant strengths and weaknesses
- Develop a strategic plan specifying how Ontario, as a province, should respond to the opportunity (strategic opportunity or enabling technology)
- Stimulate private sector initiatives

Each working group was supported by a team drawn from the private sector, the Premier's Council Secretariat, relevant government ministries and communities.

The initial list of opportunities was as follows:

- Telecommunications / Informatics / Software
- Wood-Based Advanced Materials and Systems ("World House" including modular housing and smart buildings)
- Minerals / Advanced Metallic Materials / Specialty Products
- Systems Integration Products and Services
- Green Industries
- Educational Software and information technology (IT)-based curricula
- New Auto / Transportation Systems
- Health Systems
- New Value-added Food Products / Sustainable Agriculture
- Plastics and Molded Materials
- Biotechnology

Several of these opportunities were already under development. An Advisory Committee set up by the Ministry of Culture and Communications had developed a telecommunications strategy for the province and work on its implementation was under way. A team led by the Ministry of Energy was dealing with Green Industries. Initial steps to develop Health Systems opportunities were being taken in the Ministry of Health. The Ministry of Agriculture and Food was also considering a similar process.

The Strategic Opportunities Task Force facilitated the establishment of processes to explore the remaining opportunities and enabling technologies. There were several results from this work.

First, the extensive amount of activity focusing on opportunities helped to dispel the sense of gloom that was pervasive in Ontario at the time;

Second, the process stimulated entrepreneurial thinking, and led to a number of deals. Other private sector groups spontaneously began to carry out similar processes of analysis when looking at additional opportunities;

And third, as I will discuss later, the process served as a catalyst in the creation of several IBEs, and resulted in a number of consortia and joint ventures.

As you know, most of these opportunities were successfully developed, and are making a significant contribution to our current prosperity.

Software Systems and Information Technology Services

Let me illustrate how the strategic opportunities process worked by pointing out some of the initiatives it stimulated in one area. A working group was brought together in the early 1990s to explore the case of software systems and Information Technology (IT) services. The precondition for the success we have achieved was the recognition by this group of the primacy of software and services in the way information technology would evolve in future.

The initiatives that followed included:

- The seemingly insignificant, but in reality critical, acceptance of software products and related services as activities requiring valid data for analysis and tracking and a strategy for development. Prior to 1993, it was impossible to get data on these activities, and government policy makers viewed them as less important than sectors which historically employed significant portions of the workforce;

- A strategic procurement program which fostered Canadian home-based companies. Earlier provincial government policies of the 1991-1992 period which essentially closed the Ontario government (the largest single customer in the province) to software development and IT services were reversed and local companies began to flourish;

- The launching of the International Software Repository (ISR). The worldwide clearing house and library of software components now has its headquarters in Toronto. The ISR - a not for profit foundation - was initially funded by a wide range of hardware and software suppliers who provided initial capital. It now receives revenues for the licensing of its technology, verification of vendor standards compliance, contract research, and training and educational activities. The ISR has helped make Canada and Ontario a world software centre, mainly because most of its work is contracted out to local software companies. Not only have these companies flourished and developed unique competencies, but there have been important spin-off effects on the users of technology in Ontario as well.

- The efforts to encourage IBEs, which typically include at least one software company, and the related tax changes which stimulated much higher levels of investment by business in innovation generally, and software development in particular.

- The fostering of innovative technology trials and experimentation with new generation software by businesses in Ontario. This was initiated by a massive campaign in the early 1990s to encourage user organizations to shift from traditional computing platforms to systems which were open, networked, distributed, and object-oriented. The campaign involved the Ontario Information Technology Awards, given to companies that had succeeded through their innovative use of IT.

- The successful resolution of the human resource crisis in software development. A 1992 Employment and Immigration Canada study showed that the 100,000 software developers in user organizations at the time lacked appropriate skills and knowledge, having been schooled in the traditional approach. Further studies showed that Canadian software development companies were having considerable difficulty acquiring the skills needed for creation of state-of-the-art products and services. The solution to these problems came from several sources: changes to Canada's immigration policies to encourage software developers in countries such as India to immigrate to Canada; a program to encourage Canadian youth to pursue careers in software development and engineering; programs to encourage the retraining of software developers; and programs to encourage the implementation of new software development tools and methods, such as Computer Aided Software Engineering and object-oriented programming.

Structural Change in Government

While the strategic opportunities were all driven by the private sector, they could not have been brought to fruition without major structural changes in government. Prior to 1993, the existing structure was incapable of the degree of coordination required to provide appropriate support to the strategic opportunities identified, and did not have the scope of vision necessary to put in place the necessary infrastructure. The principal reasons for this included:

- Lack of an overall framework of strategic goals relating to wealth creation;
- Fragmentation of the government's information base;
- Few public servants in the economic ministries with experience or senior connections in the private sector;
- Lack of knowledge in government of Ontario strengths relating to technological capabilities;
- Lack of a strategic capability within the bureaucratic structure;
- Few individuals with the authority to negotiate on behalf of the entire government.

The existence of these and other barriers to change caused enormous frustration among large numbers of public servants. They recognized the inadequacies of the current structure, but were powerless to create the change needed to transform the system.

Recognizing these issues, the Premier sought the help of the Council in a two-phase process of structural reform. The Council was one of only a few existing bodies that involved members from many areas of society working together. It already included government ministers and their deputies, who would be directly affected by restructuring, as well as members from the private sector who had a stake in helping government do a better job.

In the first phase of the process, the Council was asked to help monitor a change process involving the government's structure for interacting with the primary wealth-creating sector and the economy as a whole. In the second phase, the Council was asked to assist with the design and implementation of a new institutional structure for governance.

The first phase, implemented in 1992 and 1993, involved the redesign and strengthening of a number of key functions:

- Enhancing the long-term wealth-creating capacity of the province through the development of specific strategic opportunities;
- Improving relationships with existing businesses in the province, and facilitating the investment marketing process in cooperation with communities and other governments;
- Trade promotion, involving both goods and services, and capital projects;
- Managing strategic investments by government in firms across the province;
- Managing the province's investments in its research and technological infrastructure;
- Information integration, responsible for developing and maintaining an integrated set of databases consolidating all of government's information about the Ontario economy.

As you know, by the mid-1990s, much of the information created through the information integration initiative was available to and heavily used by business, the general public, and government. Development of this information integration function was the critical ingredient that enabled the other parts of government to coordinate their activities.

The Council identified a number of critical success factors for making these functions work in support of wealth creation through idea-based innovation:

- The units could not be effective if they were organized in a traditional ministry. Several of the units needed to be able to coordinate the activities of various ministries and agencies, and therefore had to be organized as semi-autonomous units;
- To be effective, the units had to be able to get major decisions made and implemented quickly, and needed access to a new structure analogous to a "War Cabinet" where decisions are made with speed and authority;
- It was essential not to combine in the same organizational unit parts focused on long-term opportunities, and parts focused on dealing with immediate crises. If combined, the short term would always crowd out the long term;

- Each unit had to have both a policy and operating role. Business discovered in the late 1970s and 1980s that stand-alone strategic planning units were not effective. The Ontario government realized in the late 1980s and early 1990s that the same principle applies to stand-alone policy units within government;

- The units needed to be headed by individuals with sufficient seniority to navigate major ventures through the existing government system. These people also had the leadership characteristics that would enable them to empower their colleagues to transform the way their units operated;

- In order to transform their operating culture and strengthen links outside government, the units needed to be able to make extensive use of key individuals from the private sector. At least 50 per cent of staff in these units was obtained through an exchange program with business, labour, and knowledge institutions (universities, research centres, etc.). These secondments proved to be highly sought after;

- To be adequately responsive, the units needed to be free to develop their own operating procedures to support flexible, non-bureaucratic, worker-empowered organizational behaviour. For example, the units codetermined their own personnel procedures, concerning recruiting and incentives for performance. In addition, the units handled strategic procurement to meet their information requirements;

- The units had to have a continuing strong relationship with the principal codetermination body concerned with wealth creation, namely the Premier's Council on Economic Renewal. The Council, among other things, would periodically be asked to assess the performance of the new units, and ensure that obstacles to their performance were identified and removed.

The Council assisted with the major changes to government structures and processes that have transformed the operations of the Ontario government.

Evolution of the Technology Fund

On the recommendation of the Council, the government instituted measures to increase coordination of its activities in technology development. Activities had been spread among a range of programs, administered through many ministries and agencies. A concerted effort was made to create the structural mechanisms required to ensure that its major innovation-based economic development programs for tradeable goods and services became mutually reinforcing.

Significant shifts in efforts towards greater coordination could not have been possible without the introduction of a "systems thinking" approach within government. Instead of thinking of every activity or problem in terms of specific programs, more and more public servants began to think of how the programs interacted. This change in perspective had a profound impact on their analyses of issues, and on the solutions that were proposed. It also clarified the need for structures of codetermination in which non-government stakeholders became viewed as essential to any problem-solving process. Each participant was able to see where it fit into the system, and why and how policies needed to change.

One activity which increased coordination was the evolution of the Technology Fund into a Strategic Opportunities Fund, an effective, Cabinet level corporate body.

The functions performed by the Technology Fund in financing the creation of ideas remained critically important. However, analysis performed by the Council showed the extent of the shortfall in investment in idea-based innovation that had to be addressed.

To support six world-scale IBEs, the required annual investment in basic, applied, and product research and development would be $8 billion to $10 billion. At the time, total R&D expenditures in the province were less than $4 billion. It was obvious that the increase in expenditure could not come from government.

However, it was also obvious that a major change in business structures would be needed for the private sector to mobilize the capital needed to finance the required level of investment in innovation.

It was essential, therefore, to have the Tech Fund evolve into a more powerful instrument, capable of sharing the risks of major strategic opportunities for the province, and of creating the incentives required to help in the creation of innovative business enterprises.

In evaluating the government's ability to respond to strategic opportunities, it became evident that the government's resources to support strategic opportunities were, in proportion to the need, small and fragmented among a series of mechanisms in a variety of ministries.

To counteract this fragmentation, the Council recommended that the government concentrate resources in the Strategic Opportunities Fund. The new Fund would incorporate the old Technology Fund, and all of the existing programs were transferred to the new Fund. In addition, the new Fund incorporated a variety of other instruments, such as the Sector Partnership Fund, and some of the R&D and other programs scattered among numerous ministries. By combining both existing and new resources, it was possible to set the Fund at $2 billion over 10 years, despite the difficulties of the fiscal situation.

The new Fund operated much like the former Technology Fund. Strategic direction was provided by the Council, the Fund was administered through a small Secretariat, and various ministries were involved in specific projects. Given the experience with the Tech Fund, it was agreed at the outset that the Fund was not to be used for tax expenditures, as had occurred with the R&D Super Allowance.

As you know, the Strategic Opportunities Fund is still in existence, is now capitalized at $4 billion, and has played a role in the evolution of Ontario's economy over the past ten years. It continues to fund some of the original and new Centres of Excellence, exerts a powerful pull on the research infrastructure of the province, strengthens interactive links between the research and industry communities, and is widely regarded as a model by other governments.

Development of Innovative Business Enterprises (IBEs)

The realization that Ontario needed to develop a set of new innovative business enterprises grew out of the continuing difficulty technology-based Canadian firms had in moving into global markets.

It became clear that other societies had much more success than Canada and Ontario in developing business enterprises with the critical mass necessary to capture a share in global markets for innovative products and services. Ontario had one world class innovative company, but relative to the size of its population, it should have had a minimum of six. That proportion was suggested by the track records of small countries such as Sweden, Switzerland, Finland, and the Netherlands.

By now, we are all familiar with the key characteristics of these innovative business enterprises, or IBEs.

- They seek to maximize the returns to all of the stakeholders in the enterprise: the employees, the community, the province and Canada, and, of course, the owners;

- They are consistently profitable, and reinvest significant portions of profits in their people, their knowledge bases, and productive physical assets;

- Their strategy is based on changing the rules of the game, and choosing the terrain on which to compete. They do not aim to maximize profits simply by minimizing cost, but seek strategic advantages on the basis of innovation in products, processes, and organization. Investment in all aspects of innovation is high, with investment in R&D, design, and people skills leading the way;

- IBEs continuously innovate, and can keep up with or move ahead of changing markets and economic conditions. They can cope with swings in world and local market conditions. They are home-based but outward-looking;
- They have a high "knowledge intensity" and use the most advanced human and machine-based skills to generate new products and systems ahead of the competition. There is a high level of interaction with the educational and research communities;
- Their planning is long range and includes not only companies themselves, but also customers, suppliers, and governments at all levels;
- IBEs are leaders in innovative workplace design, worker empowerment, and are major supporters of the most progressive sectoral labour-management organizations;
- They are better able to set their own prices for their products in world markets, and can pay high wages. Their wealth-creating activity spills over into all the communities in which they operate;
- IBEs recognize the power of codetermination and reciprocal obligations in their dealings with their employees, government, communities, and other organizations in society.

The process of creating the first IBEs was complex, and at times difficult, but rewarding. Over the first two years, the emphasis was on creating the climate within which the private sector could work to establish IBEs. The initial step was the fostering by the Premier's Council of a common understanding that change in institutional structures was essential for the future well-being of the province. Based on this understanding, all parties were able to reshape the environment, removing barriers and creating the new relationships and structures essential to the IBE.

Some fundamental legislative and regulatory barriers were tackled first, at both the provincial and federal levels. The formation of the Communications and Informatics IBE necessitated review and modifications to combines legislation and to some aspects of regulation in order to permit the joint planning and action across the entire industry necessary to create an internationally competitive entity. The key ingredient in these changes was the realization that domestic consumers would be best served not by restrictive regulation, but by an industry positioned to meet and beat intense international competition.

Interlinked ownership, including ownership of IBE elements by financial partners, was essential to the formation of some IBEs. Combines and banking regulations were modified. Regulations which formerly placed limits on the percentages of assets that financial institutions could invest in risky, innovative businesses were widened to increase the availability of capital to finance the full spectrum of the innovation chain.

Government, industry and universities developed coordinated approaches to R&D that maximized the utilization of funds from all sources. The R&D strategies concentrated on knowledge-intensive and intelligent process technologies to maximize the output of our human resources.

As these mechanistic barriers were removed, the attitudinal barriers towards these dynamic new institutional structures also began to fall. By the mid-1990s, several new IBEs were formed. As you know, we now have eight, with a few additional ones in the process of formation.

Financing Innovation and IBEs

Another of the initiatives of the early 1990s was a series of steps to enhance mechanisms to finance all aspects of the innovation process, including the capacity to secure market share.

One of the priorities of the Council was to ensure that enhanced mechanisms to finance innovation would be focused on the wealth-creating sector, and would operate by enabling the private sector to invest without requiring a bureaucratic approval process. During 1992/93, the Strategic Opportunities Task Force worked closely with officials from the Ministry of Treasury and Economics to develop a new approach to financing innovation, including new types of financing and specific tax measures to create incentives for the formation of IBEs.

In the initial stages, a variety of tax mechanisms was considered, including:

- flow-through shares, which were an attractive option in start-up situations where new companies lacked taxable income;
- changes to tax rates;

- special capital gains provisions for long term investment in innovation;
- and changes to the existing tax credits for R&D.

Eventually, a package of changes was agreed to that could effectively be implemented at the provincial level. As you know, the federal government and other provinces eventually moved in a similar direction.

As a result, Ontario businesses enjoy one of the most supportive tax regimes for financing innovative business activity. There has been a major inflow of innovative activity into the province, which has generated more than enough additional tax revenues to cover the cost of the incentives.

Another approach, the development by Ontario's financial institutions of specific units to handle financing of innovative enterprises, has resulted in a major increase in private-sector investment in wealth-creating activities in the province. Initiatives that government was involved in provided other sources of financing and helped raise awareness of the need to change attitudes to the financing of innovation. These efforts have been further supplemented by capital from Taiwan and Mexico, among other countries, which see Ontario as the most attractive place to invest in North America.

Measuring Return on Investments in an Innovative Society

An additional important initiative of the Council was work designed to increase the effectiveness of investment in innovation capacity in Ontario in the early 1990s. One of the main perceived barriers to increasing investment in innovation was the lack of clear measures of the returns these investments could generate. As a result, the Council established a working group to determine how the private and public sectors could measure the results of investments in human capital and innovation.

The group's work with Statistics Canada and a newly formed cross-Canada network helped in the development of ways to track primary wealth creation. In addition, we are now in a position to set targets for health, well-being, and our environment and measure our progress toward those goals.

At the more detailed level, government was able to restructure its financial reporting, accurately reflecting its expenditures in three categories: consumption spending, investment in physical infrastructure, and investment in human skills and innovation. The government can now report each year on the return on investment achieved through its cumulative investment in human development and innovation.

Furthermore, the private sector recognized the inadequacies of its accounting systems in allowing for the cost of ideas, and the productivity of knowledge workers. The Canadian Institute of Chartered Accountants took up the challenge, and by 1996, had implemented a new supplementary system of financial reporting. Of particular importance is the recognition that the costs of all components of the innovation system over time have to be treated as long term investments. As you know, the new system of Generally Accepted Accounting Principles is more credible than the old one, and the Canadian accounting profession is working in a number of countries to implement a similar set of standards.

Concluding Remarks

There are many other changes I could mention that have occurred in the past decade. However, the main idea I would like to leave with you is the key role that partnership based on codetermination played in enabling the province to build a new economy based on wealth creation through ideas. Today, we see wealth creation as intrinsically linked to well-being and sustainable development. This is symbolized by the fact that the Premier's Councils and the Round Table were merged into one body in 1996. While there are many more challenges ahead of us, it is appropriate that we begin by acknowledging our debt to those who played such a big role in making Ontario what it is today.

End of Premier's Address

4. Key Steps to Take Now to Get to the Vision of 2002

4. Key Steps to Take Now to Get to the Vision of 2002

This chapter outlines the key steps the Task Force recommends be taken now, in order to ensure that the year 2002 can resemble that depicted in the fictitious Premier's presentation. It includes information on initial, as well as the final, recommendations of the Task Force on the Technology Fund in the Context of an Innovation-Based Society to the Premier's Council on Economic Renewal.

The process of moving toward the future described in this report has already begun. Implementation of several initiatives described in the original draft report presented to the Premier's Council on Economic Renewal on April 30, 1992, is under way. Members of both Premier's Councils have met with representatives of the Round Table on Environment and Economy to discuss the potential for developing Strategic Goals for Ontario. The government has already responded to some of the short-term recommendations of the Task Force on Investment aimed at addressing concerns about the investment climate in Ontario.

The members of the Task Force believe that the Premier's Council is an institutional innovation that can, throughout this decade, play a crucial role in accelerating Ontario's transition to an innovation-based society.

Strategic Goals for Ontario

A basic premise of the Tech Fund Task Force is that primary wealth creation, in the sense used in this report, is a means, not an end in itself. Improving our capacity to create wealth is compatible with enhancing our social and physical environments. However, we require a better understanding of the relationships between well-being, wealth creation, and the social and physical environments, in order to reorient our approach as a society to consumption and investment.

In its draft report, the Task Force proposed that the Premier's Council on Economic Renewal invite the Premier's Council on Health, Well-being and Social Justice and the Round Table on Environment and Economy to participate in a joint process of developing an initial set of strategic goals for Ontario related to well-being, wealth creation, and the environment.

The purposes of the process would include:

- Setting measurable goals that, subject to appropriate analysis and confirmation, could galvanize joint action by business, government, labour, the education and research sectors, communities, and other groups;

- Making explicit the interdependencies among the concepts of wealth creation, well-being, and sustainable development;

- Creating a framework of goals that would enable development of a set of indicators comparing Ontario with other jurisdictions in North America and other selected countries.

Representatives of the two Councils and the Round Table have met and, as an initial step, prepared a comparative overview of the work of each group.

It remains to be seen where this initial step will lead. It is the hope of the Task Force that the three groups will continue in a process of codetermination that is successful in helping the evolution of a set of strategic goals for Ontario.

Some have expressed concern that strategic goals for Ontario would end up being vague and rhetorical, and that the process would be a waste of time. However, the Task Force believes that a more likely result is a deeper understanding of values that are shared among members of the organizations involved, and that shape our collective vision of the future and sense of reciprocal obligation. If the three organizations can develop a shared vision of the future, expressed in the form of strategic goals and crafted through a process of codetermination, they could become an effective force for change.

Developing a Strategic Plan for Wealth Creation in Ontario

As the Task Force continued its work, it found further reinforcement for the belief that we in Ontario now face profound structural change in our economy and society. Our situation is not unique. The forces driving this change are affecting countries as well.

It is the Task Force's view that Ontarians need to choose explicitly our directions as a society. Having chosen that path, we need to take actions and initiatives that will help us get there. Like an oil tanker, we cannot turn on a dime: the decisions and actions we take in the next two years will be critical for the socio-economic direction of our society ten years from now.

The Tech Fund Task Force developed a vision, and attempted to communicate it through this *Ontario 2002* report. However, this represents only the view of the Task Force. To create the momentum for change requires that many others be involved.

The Premier's Council on Economic Renewal has a crucial role to play in helping to build the vision and promote change. To do so requires more explicit linking of the work of the various task forces. Beyond the Council's current initiatives, we need to create the context for more coordinated interaction among individuals and groups in business, labour, government, communities, and other institutions committed to building a prosperous Ontario.

Recommendation 1: The Premier's Council on Economic Renewal should help develop and communicate an overall Strategic Plan for Wealth Creation in Ontario.

Such a strategic plan would focus on the specific steps needed to enhance the capacity of the province to create wealth through idea-based innovation. It would be a codetermined strategic plan for the province as a whole, not just the government. It should build on directions proposed by the government in *Budget Paper E* of the 1991/92 budget, the *Industrial Policy Framework for Ontario*, and the 1992 Budget Paper on *Investing in Tomorrow's Jobs: Effective Investment and Economic Renewal*.

Evolution of the Task Force

With this report, the Tech Fund Task Force presents a plan for the evolution of the work which it began.

In the previous draft of this report, the Task Force recommended that the Council launch four interrelated processes to enhance Ontario's wealth creation capacity. Over the summer, the Task Force's thinking has progressed, and several events occurred which had to be taken into account. All of the elements previously suggested are included, but the recommended plan has been reshaped.

The Task Force believes that its work should be carried on through two new task forces derived from the original group. One would be called the Strategic Opportunities Task Force, and the second would be known as the Task Force on an Innovation-Based Society.

The rationale for each, and a description of the work to be undertaken, is provided below.

Strategic Opportunities

In *An Industrial Policy Framework for Ontario*, released in July 1992, the government places a new emphasis on working with sectors. Furthermore, the government has assigned lead responsibility for a wide range of sectors to specific ministries.

This emphasis on sectors is appropriate, as competing jurisdictions have had a sectoral approach for many years. Embarking on the sectoral approach is an important first step in enhancing wealth creation. However, we believe that as we build a more innovative economy we also need to move beyond traditional sectors.

For most people, the word "sector" refers to the division of economies into groupings of similar firms - such as steel and auto assembly. While it is important to encourage existing sectors to maintain their competitiveness, it is equally important to recognize that as a result of idea-based innovation and technological change, many traditional sectors in Ontario are declining, in employment if not output. Addressing growth opportunities requires going beyond traditional sectors to encompass new patterns of innovation.

Developments in three principal technologies — materials technology, biotechnology, and information technology — are transforming the structure of the world economy. They do so in two ways. One is by radically improving the production of existing goods and services; the other is by creating new products and services.

The Task Force believes that to respond effectively to technological change, Ontario must build on its sectoral focus with two complementary approaches.

The Task Force coined the term "Strategic Opportunities" to refer to potential new sectors in the economy, developed through collaborative action by existing sectors. For example, as is explained in detail below, technological developments now permit the construction of houses and commercial buildings using modular construction, advanced computerized control and communication systems ("smart buildings"), and new composite materials. An opportunity exists for Ontario to be a player in the new industries that will develop, but this requires collaboration on the part of the current materials, manufacturing and construction sectors, along with labour, government, and research and educational institutions. There is evidence that Japan and some U.S. states are already moving in this direction.

Many other examples of strategic opportunities exist. Their main characteristics are that they are cross-sectoral, represent large economic opportunities, and cannot be developed without collaborative action and investment led by the private sector. Some of these initiatives could lead to IBEs.

The second approach focuses on what the Task Force calls "Enabling Technologies."[3] These technologies have the ability to create entirely new products and services and/or transform existing products, services, and entire sectors. Such technologies can usually be applied to many sectors — some might actually be considered sectors in themselves. Semiconductor electronics (e.g., the transistor) is the clearest example from the recent past of an enabling technology which has become generic.

Since enabling technologies can have a pervasive effect on the economy, it is important for Ontario and Canada to emphasize the development and diffusion of these technologies. The Centres of Excellence program has created a sound base for some enabling technologies.

Over the summer of 1992, the Task Force explored a number of strategic opportunities and enabling technologies. Members of the Task Force met with government officials responsible for the Green Industries Strategy, which is an excellent example of a cross-sectoral strategic opportunity. The Advisory Committee on a Telecommunications Strategy for the Province of Ontario recognized that telecommunications is both an enabling technology, and presents a number of major strategic opportunities, such as multi-media educational software.

The Task Force also explored several examples of opportunities that were not actively under development in Ontario. In order to illustrate both the challenge and the potential, one strategic opportunity and one enabling technology are described in more detail.

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[3] There are several competing interpretations of the differences among "enabling," "generic," "critical," "core," and "strategic" technologies. The Task Force chose the term "enabling technology" to refer to those with potential to become generic, i.e. to affect the entire economy (Imai & Baba, *Technology and Productivity*, OECD, 1989). For example, Alan Bromley, the U.S. Presidential Science and Technology Adviser, suggests advanced materials processing and high-performance computing have "effects across the board" (*Economist*, July 25, 1992). "Critical" or "strategic" technologies are those identified as vital to a jurisdiction's geopolitical or defence interests.

The "World House"

In Pittsburgh, Pennsylvania, a consortium of companies in the construction, materials, and manufacturing industries was formed several years ago to develop prototype "smart houses" which could illustrate the potential impact of new high-tech systems on housing. Similar initiatives are under way in Japan.

Approximately 25 per cent of housing currently built in the United States is manufactured or industrialized housing, i.e., built off-site. It is expected that this percentage will continue to rise, and that pressure to import more of these units to Ontario will increase.

In Japan, the demand is growing for larger western-style housing, at a time when the average age of a carpenter in that country is 57. Japan is already importing teams of construction workers from the United States.

In Russia, Eastern Europe, and many other parts of the world, the demand for better housing is already strong and will keep growing. It was noted that Russia alone needs four million housing units per year. By comparison, the U.S. produces approximately 1,500,000 housing units per year.

The World House working group formed by the Task Force concluded that the combination of new materials, smart house technologies, and new modular building techniques will eventually transform the way houses are built in Ontario, and around the world. The question is whether Ontario will be an exporter or an importer of the new building technologies and the related components and equipment.

Potentially, Ontario has a unique combination of skills and natural resources that would enable it to provide cost-effective customized housing of all types, from the most basic to the luxurious.

The World House concept merges skills in advanced materials, computer-aided design, communications, transportation, energy conservation, and construction to produce the dwelling of the future. Here are some of the potential features of the World House:

- Customers use intelligent terminals to custom design their house, based on a wide range of modular options;
- The design is sent electronically to a network of suppliers and manufacturers, all working on just-in-time delivery;

- The manufacturing process employs new and traditional wood and mineral-based materials, and combines them with highly flexible systems for electric power, communications, energy production and conservation and plumbing;
- The components are assembled and packed for transportation in a manner that ensures quick delivery and easy, on-site assembly.

The World House does not refer to a particular design of house, but rather to a new approach to designing and building housing that can be applied to a wide range of housing needs throughout the world.

The development of the World House provides a number of opportunities for Ontario and Canada. It provides a stimulus to ensure that new jobs and skills are developed which focus on growth-oriented, export markets for the future. As traditional applications are eroded, it provides a new use for wood fibres and minerals from Northern Ontario. Its development would create many spin-off opportunities. One that arose in the conversation at one working group meeting was integrating building code requirements into the computer-aided design programs used by designers and customers, so that building inspectors could validate drawings instantaneously through an expert system combined with electronic data interchange. These systems themselves would have a market in jurisdictions that wanted to eliminate backlogs in building permit operations.

While there is an increasing number of companies in Ontario that manufacture modular housing (and some, such as Royal Plastics, that are using new materials), it is evident that the ability to design and produce the World House is beyond the capacity of any one company. For that matter, it is beyond the capacity of the construction sector as a whole. Developing this opportunity would require a collaborative approach involving the construction, manufacturing, design, information technology and materials sectors, along with labour, government, and research and educational institutions. This process would likely lead to institutional innovation. The opinion of the group that met on this concept was that the private sector would be enthusiastic about the opportunity to participate in a serious effort to develop a strategy for Ontario relating to the World House concept.

The Ontario government has assigned responsibility for these sectors to various Ministries. The forest industry is the responsibility of the Ministry of Natural Resources. The Ministry of Industry, Trade and Technology handles a variety of manufacturing sectors, and has an effectively functioning Construction Industry Advisory Committee. However, there is no process or unit that we are aware of that has the responsibility or the capability to play a facilitative role in the development of a strategic opportunity such as the World House.

Biotechnology

As an example of an enabling technology, the Task Force chose biotechnology. It has the potential to contribute to human well-being and develop solutions to many of the problems our society faces. Using living organisms to produce goods and services, biotechnology's principal applications include:

- The control and prevention of diseases. Insulin was one of the earliest of what have become known as biopharmaceuticals. If the cures for AIDS and cancers are discovered, it will be a result of biotechnology.

- The production and processing of food. Research in biotechnology offers the potential to achieve sustainable agriculture without reducing yields. This can be done by replacing many chemical fertilizers and pesticides, by developing crops whose needs are consistent with the natural availability of water, and by treating farm wastes using bacterial methods.

- The treatment of waste. Biological remediation methods are being developed to clean up contaminated soils, effluent, and discharge.

- Energy production and conservation. For example, methane from biomass is being investigated as a renewable source of energy.

As an enabling technology, biotechnology will transform virtually all sectors of the economy. Competitive application of biotechnology will be a critical determinant in the commercial success of many industrial sectors in the future. Leadership in the competitive race will go to those regions that most rapidly incorporate biotechnology into the fabric of industrial production.

Ontario currently is home to 103 biotechnology companies covering a wide range of applications. These constitute 44 per cent of all Canadian biotechnology firms, according to *Canadian Biotech '92*, an Ernst & Young study. There was a 22 per cent growth in the number of biotechnology companies formed in Ontario between 1989 and 1991. Most of these companies are small. While the field is rapidly growing and promises major economic opportunities, it is still at a young and fragile stage of development. A supportive infrastructure and nurturing environment is required for long-term sustainable growth.

Regional clusters of biotechnology companies and activity exist in London, Guelph-Waterloo, Greater Toronto, and Ottawa-Carleton. Strong regional private sector organizations such as the Toronto Biotechnology Initiative have formed, bringing together researchers, industry, finance, law, accounting, and all levels of government.

Various Ontario ministries provide funding for biotechnology research, and support other specific initiatives. However, there appears to be no overall strategy for the development of biotechnology in Ontario, and no mechanism for coordination of the biotechnology research and initiatives of the various ministries. At one time, such a mechanism did exist, and led to the creation of Allelix Biopharmaceuticals. However, the organizational focus for biotechnology in the Ontario government disappeared in the mid-1980s. In 1988, the Premier's Council report, *Competing in the New Global Economy*, identified biotechnology as an emerging industry, and devoted a chapter to its potential in Ontario.

In a highly competitive environment, sustaining the growth of biotechnology in Ontario will require a clear strategy and commitment by the Ontario government. The federal government has targeted biotechnology as an industry of strategic importance, but provinces other than Ontario have been the main beneficiaries of federal support. Quebec, Alberta, Manitoba, and British Columbia all have strategies to develop biotechnology. States such as North Carolina are making a concerted effort to attract biotechnology companies, including Ontario-based companies. Biotechnology and its applications will continue to benefit from a world-wide development effort. The critical question is whether Ontario will support and retain significant home-based biotechnology enterprises.

Given the diversity of its applications, it is difficult to assign biotechnology to a particular "lead ministry." It may be necessary to invent a process or unit that has the resources and capability to facilitate the growth of an enabling technology like biotechnology.

The Strategic Opportunities Task Force

The Tech Fund Task Force believes that Ontario's efforts to strengthen sectors should be supplemented by processes to develop strategic opportunities such as the World House and enabling technologies such as biotechnology.

These processes should not be government-driven. They should be steered by the private sector. However, in most instances, government, through institutions like the Premier's Councils, is one of the few organizations with the ability to initiate discussion among potential participants to get the process started.

The best way to initiate the process is to invite the participants to develop a strategy for the province, not for the government.

In some cases, there is an obvious place within the government structure that can facilitate the process of codetermination necessary to develop a strategy that is shared by the private and public sectors, as in the case of the Telecommunications Strategy. However, World House and biotechnology are examples where there is no obvious process or unit with the capability to play the required facilitation role. Whether in the long run this capacity should exist within government, or whether a new outside body should take on this role is one of the issues the new Task Force should consider.

Recommendation 2: A Strategic Opportunities Task Force should be created with a core of members from the Tech Fund Task Force, supplemented by other new members.

Recommendation 3: The Strategic Opportunities Task Force should launch and oversee two pilot processes, one focused on a strategic opportunity, and another on an enabling technology. Resources from the Premier's Council Secretariat and from relevant ministries should be assigned as required to support these pilot processes, with a target completion date of June, 1993. While the Tech Fund Task Force believes that the World House and biotechnology would be useful projects, it does not wish to preclude the possibility of alternative ideas emerging from the new Task Force. **The objective of each pilot project would be to develop a strategy for Ontario as a province relating to the strategic opportunity or enabling technology.** It is anticipated that the process will put businesses and other participants in a position to assess the risks and opportunities involved, and determine what actions would need to be taken by business, labour organizations, research, financial institutions, and the Ontario government in collaboration with other levels of government. It should be noted that the Task Force believes that the pilot projects should be open to participants from elsewhere in Canada.

Recommendation 4: Based on the experience of these pilot processes, the Strategic Opportunities Task Force should advise on the institutional capabilities required in Ontario and Canada to deal with similar processes in the future.

Recommendation 5: The Strategic Opportunities Task Force should develop an ongoing process for identifying other strategic opportunities and enabling technologies that are not currently being developed elsewhere, explore opportunities identified with members of the private and public sectors, and present their findings at subsequent Council meetings. A way of communicating these ideas should be developed to create the possibility that some opportunities would be pursued spontaneously by the private sector.

The Transition to an Innovation-Based Society

The Task Force was charged with examining the Tech Fund as an investment in building a more innovative economy. In carrying out this mandate, we found ourselves faced with complex institutional structures that must interact if Ontario is to build an innovative economy. It is clear to us that the synergy and dynamics among the different institutions will be of critical importance in building an innovative economy.

One of the key themes that emerges from this examination is recognition of the need for fundamental change to many of our existing institutions. We have pursued this theme in conversations with many members of the Council and individuals outside the Council, and have found substantial agreement.

In our discussions:

- Some of the business representatives on the Council indicated that some form of innovative business enterprise structure would be necessary to escape the short-term focus imposed by the preoccupation of many investors with quarterly earnings.

- Some representatives of financial institutions expressed their concern that changes in relations between pools of capital and business enterprises are essential.

- Deputy Ministers confirmed that major structural changes in government are necessary for government to play its role in wealth creation.

- The need for changes to our educational institutions is evident from the work of the Task Force on Lifelong Learning.

- Labour representatives noted the need for a much stronger sense of the collective interests shared by managers and workers in relation to the wealth creation process. In the absence of an understanding of common interests, the adversarial process can become a negative force, rather than a positive one. Furthermore, a clearer vision of the functions labour organizations can play in an innovation-based society is needed.

- Representatives of educational institutions are well aware of the need to restructure their organizations. Our predecessor Premier's Council recognized the need to shift the entire educational system toward "lifelong learning." The recommendation to establish an Ontario Training and Adjustment Board (OTAB) was an example of institutional innovation.

The current government's recognition of the need for various forms of institutional change is evident in its support for OTAB, and in various government publications, including *Budget Paper "E"* of the 1991/92 budget, the *Industrial Policy Framework*, and the most recent budget paper on *Investing in Tomorrow's Jobs.*

While there is substantial consensus on the need for change, it is less clear what specific changes are required.

The Task Force has recognized that its work on the transition to an innovation-based society should continue, working at two levels.

There should be an ongoing dialogue with all involved individuals that builds a framework of understanding about wealth creation through idea-based innovation and the need for fundamental change in institutions. The main purpose of this dialogue is to create openness to new ways of thinking and action. However, it will not in itself lead to different decisions by leaders of existing institutions, unless the detailed analytical work to create the necessary framework of understanding to support these decisions, is also done.

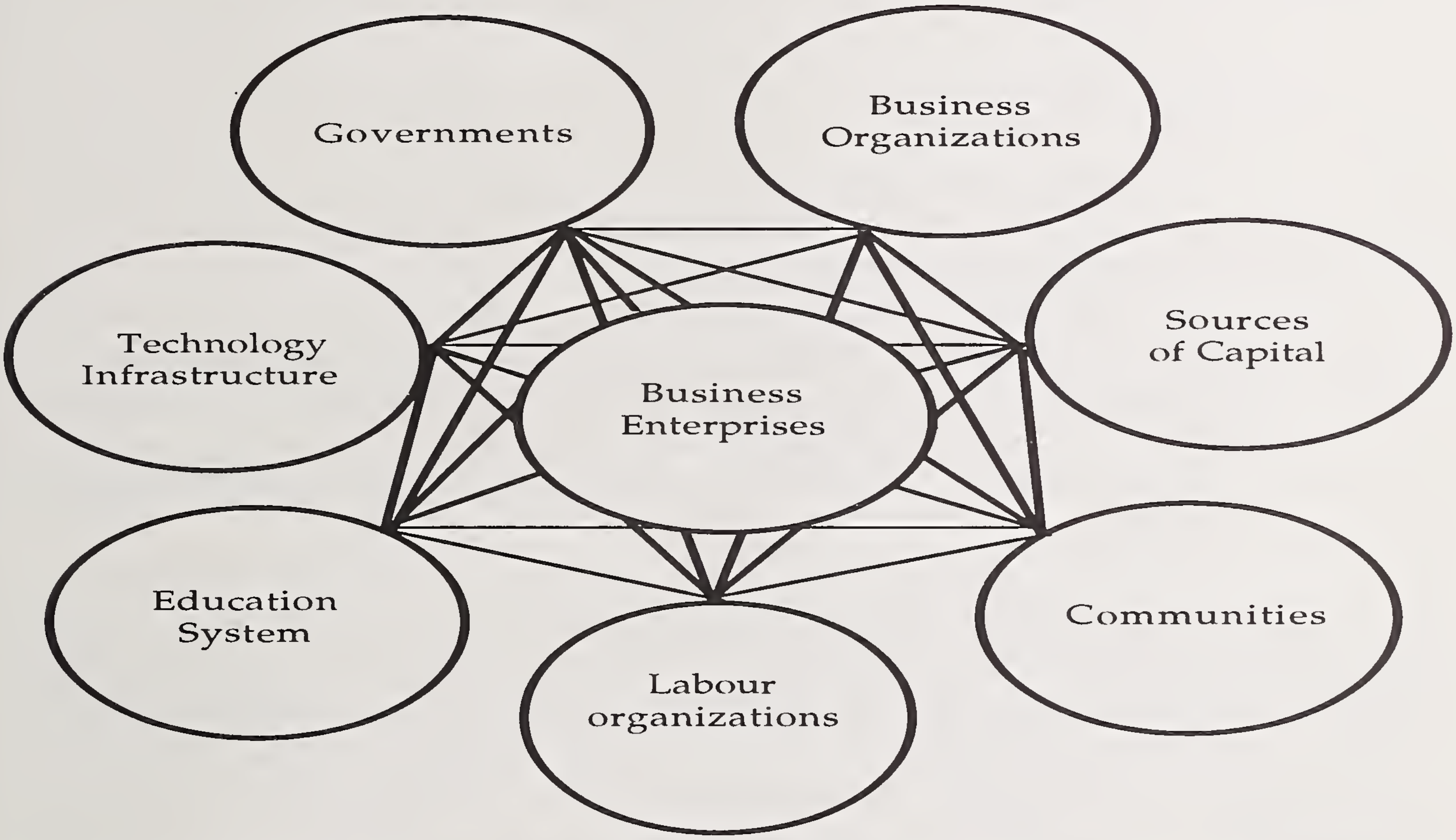
Therefore, a parallel process should be established that takes the basic hypotheses we are exploring to the stage where decisions for change can be taken. This involves a process of collaborative exploration and analysis.

For example, we have presented the innovative business enterprise as a potential model of a new form of business institution. There is high level agreement that something like an IBE is possible and necessary. However, the detailed work required to enable the establishment of a specific IBE has yet to be done. To be credible, it must be carried out in a manner that involves both public and private sectors.

The Innovation "System"

To elaborate further on the detailed work required to enable institutional change involves adopting a "systems-thinking" perspective. Various observers have begun to compare the national systems of innovation in Japan and other Asian countries, Europe, and the United States. To move to an innovative economy, we decided to consider Ontario in this context, and to examine the role of institutions accordingly.

Some of the elements that would constitute part of Ontario's participation in Canada's potential innovation system are included below:



In contemplating the interaction of these elements of the innovation system, it is necessary to compare the functions performed by each component in Ontario and Canada with the functions they perform in other jurisdictions, and to analyze the signals and pressures within the economy that reinforce change or the status quo.

Many members of the business community in the tradeable goods and services sector recognize the need for new institutional arrangements if they are to become more innovative. Individuals in the labour movement appreciate that new institutional developments are occurring which could play a role in the revision of the old adversarial, arms-length, labour-management relations.

The Tech Fund Task Force has already taken steps to consider an innovation system. A group has been pulled together to look at the problem of financing innovation and the kinds of institutional changes that may occur. Another group has been convened to develop ideas on government capabilities in an innovation-based society.

It is expected that additional working groups could deal with:

- business enterprises, including further development of the IBE concept;
- the Technology Infrastructure, which includes various government-sponsored, university-based, and private sector organizations involved in the creation and dissemination of scientific and technical knowledge;
- communities, dealing with their role in the innovation system.

The work of other Task Forces might contribute to a better understanding of how labour institutions may evolve (Organization of Work), and the evolution of the educational system (Lifelong Learning).

Work on the innovation system would also examine measurement systems at both the business and economic levels, and the extent to which these systems may need to change to reflect new realities. An innovation-based society needs the ability to measure return on both public and private investment in human capital and innovation.

Recommendation 6: A Task Force on an Innovation-Based Society should be created with a core of members from the Tech Fund Task Force, supplemented by other new members. This new Task Force should carry on the detailed work involving the various components of the "innovation system," using a process of collaborative exploration and analysis and building a framework of understanding.

Recommendation 7: The new Task Force should continue the dialogue with individuals and groups in all parts of society about the framework of understanding at the basis of our recognition of the need for change, to help lay the groundwork for codetermination and recognition of reciprocal obligations.

The Evolution of the Technology Fund

The Technology Fund represents a government investment in laying the foundation for idea-based innovation in Ontario. It has already had an important impact on the wealth creation capacity of Ontario. This impact is partly a result of the Technology Fund programs. However, in both its concept and operation, *the Technology Fund has been more than simply a collection of programs*. This must be recognized, both in its structure and operation, as we move to the next stage in the evolution of the Technology Fund. Sustaining the momentum of the Fund should be given high priority.

Our recommendations about the evolution of the Technology Fund recognize the enormous fiscal pressures on the government, caused largely by a weakening of the province's ability to create the wealth needed to sustain and improve our social and physical environments. However, dealing with this problem requires sustained public and private investment over many years to build a strong primary wealth-creating sector founded on idea-based innovation.

Part of our dilemma is that our private sector currently lacks the institutional structures to play the role it should in financing innovation. As a result, the onus falls to a larger degree on the public sector to provide the initial incentives needed to reshape the system as well as sustaining its key infrastructures.

The Technology Fund Programs

We began our review by looking at the Tech Fund programs. The five most important programs are the Centres of Excellence, the Industry Research Program (IRP), the University Research Incentive Fund (URIF), the Technical Personnel Program, and the Technology Adjustment Research Program (TARP).

The Centres of Excellence program ($40.8 million in 1991/92) has played an important role in changing attitudes and creating new institutional links among academic researchers in Ontario, and between academe and the private sector. While more needs to be done, progress has been recognized in external assessments of each Centre. The Task Force commends the government's decision to continue the Centres of Excellence program.

The Industry Research Program ($21.4 million in 1991/92) works at building cooperation at the pre-competitive research level. Its goal is "to stimulate cooperative ventures in research, development and technology applications in areas of strategic importance." The program is achieving its objectives: three of nine projects assessed in 1991 are already commercially successful; $34.5 million IRP support should generate $944 million in sales by 1997; and inter-company and industry/academic links are evident. IRP has also produced substantial returns to the Treasury through taxation.

The University Research Incentive Fund's goal is "to encourage universities and the private sector to enter into cooperative research ventures" ($6.7 million in 1991/92). URIF contributions have provided 36 per cent of the total project costs. URIF is delivered through the Ministry of Colleges and Universities. Two hundred and fifty different corporations have been involved, the majority of which are small businesses. The program has been instrumental in helping many small businesses develop an innovative capability. This is an important base for the future economic growth of the province.

The Technical Personnel Program exists to help small Ontario companies increase their technical and scientific expertise. The program ($4.6 million in 1991/92), which pays part of the salaries of new engineering, scientific, and technical staff over a three-year period, is designed to encourage small companies to better develop and apply advanced technology. There is also cooperation with the National Research Council, which helps with technical assessment of proposed projects.

The Technology Adjustment Research Program ($0.8 in 1991/92) is designed to bring labour and management together to study the effects of new and changing technologies. The goal is to minimize and overcome the disruption in workers' lives and jobs, as well as disruption to the production process, that can result from technological changes. TARP is undergoing a peer review in 1992-93. This program can play a significant part in helping to build new labour-management relations.

The level of funding for Tech Fund programs

In its interim report in January, 1992, the Task Force recommended that the government maintain its current funding levels for Tech Fund programs.

On July 30, 1992, Ed Philip, Minister of Industry, Trade and Technology, announced that the original $1 billion allocation of the Technology Fund had been fully committed, and that the Ontario government was proceeding with a long-term commitment of $81 million a year for the direct funding programs.

The funding level of $81 million established for the Tech Fund programs in 1992/93 and beyond substantially reflects the Task Force's recommendation, in the context of the current fiscal pressures.

However, the Task Force believes this is the minimum level of public sector investment required to help create a more innovative economy. During this period of limited resources, we believe the emphasis of the government should be to constrain its spending on consumption, and increase its investment in sectors that help build the new wealth-creation capacity.

Furthermore, we understand that there is a cash flow problem in the 1993/94 fiscal year that affects the University Research Incentive Fund. It would be unfortunate if this low-cost but effective investment in our future wealth-creating capacity were jeopardized.

Recommendation 8: The Tech Fund Task Force commends the government for recognizing the Tech Fund programs as an important investment for the future through its long-term commitment of $81 million per year to the Tech Fund programs, and urges the government to establish a stable, long-term source of funding for URIF as well as the other programs.

The structure of the Tech Fund

On July 31, 1992, the government announced the continuation of the Tech Fund as "Technology Ontario." While in most respects this was a positive step, it is unclear what role the Premier's Council on Economic Renewal has in the future of Technology Ontario. Since many aspects of the Tech Fund arose out of codetermination, the role of codetermination in the future of Technology Ontario needs to be revisited.

Recommendation 9: Codetermination should continue to exist in the development and operation of the programs administered by Technology Ontario.

Recommendation 10: The Premier's Council on Economic Renewal should have a continuing role in providing strategic direction in the evolution of Technology Ontario.

Recommendation 11: The Ministry of Industry, Trade and Technology (MITT) should be requested to provide the Premier's Council with its recommended design of the mechanisms through which the Council continues its involvement with Technology Ontario.

Ontario's overall approach to technology development

Ontario's current technology development and industrial assistance programs are dispersed throughout a wide variety of programs, administered by many ministries and agencies. While total spending is considerable, the effect is fragmented. Expertise developed in one department is infrequently accessed by others.

Programs funded by Technology Ontario cover only about one-third of Ontario's funding for research and development. At a strategic level, there appears to be no mechanism for coordinating the activities of various ministries relating to technology development.

Treasury Board is starting its second review of industrial assistance and research and development programs, with the primary objective of consolidating and refocusing existing programs and examining more cost-effective ways of delivering them. However, the Tech Fund Task Force believes that a more strategic perspective is required than has previously been taken by the Ontario government.

In a recent report (*Gaining New Ground: Technology Priorities for America's Future*), the U.S. Council on Competitiveness demonstrates that unlike 20 years ago, the U.S. is no longer leading in most areas of technology. The implication is that it now must begin to focus its efforts. If the U.S., with 260 million people, cannot be good at everything, it is even more evident that Ontario, with ten million people, has to focus its resources carefully.

Ontario needs to have a clearer idea than it currently has of its investment priorities for technology development — those areas that have potential for the future in global market niches, and build on existing research and industrial strengths. This information must be available to the entire government, not just to particular ministries.

Spending on technology development, however, is just part of government's role in building innovation capacity in the provincial economy. Government's influence over the provincial economy is relatively small. To make a difference, it is critical that all programs affecting the development of the components of an innovation-based economy be mutually reinforcing. It will be self-defeating if Technology Ontario, the Sector Partnership Fund, and Innovation Ontario — not to mention strategic procurement, and various aspects of regulation — are not carefully coordinated in terms of their impact on building an innovative economy.

In summary, there are three basic challenges facing the Ontario government:

- improving its corporate capacity and information base relating to its role in helping create a much stronger innovative economy and innovation system;

- developing the ability to work with the private sector and institutions to set priorities to ensure that public spending is being appropriately focused on areas where it can make a difference, and is not being spread too thinly across all areas;

- Creating the structural mechanisms required to ensure that its major innovation-based economic development programs for tradeable goods and services are mutually reinforcing. This idea was behind the suggestion that a "Strategic Opportunities Fund" be created.

The Tech Fund Task Force recognizes that new capacity, information bases, priorities, and structural mechanisms cannot be developed overnight.

Recommendation 12: Since the Ministry of Industry, Trade and Technology (MITT) is being restructured, the government should take advantage of the opportunity to bring all of MITT's technology-oriented programs under the Technology Ontario structure. In the operation of Technology Ontario, it is essential to continue to use the former Technology Fund programs to encourage codetermination and new institutional links and structures.

Recommendation 13: The government should create an effective network of people involved in science and technology related to the development of an innovative economy throughout the Ontario government. This network should meet regularly to establish relationships and exchange ideas, and develop a set of training courses on managing technology development.

Recommendation 14: The government should, in incremental stages, develop a comprehensive information base on Ontario's technology infrastructure necessary for an innovative economy. The first step in this process should be to develop a matrix that shows spending on technology development and innovation by each ministry and agency, mapped against the technologies being developed. The second step should be to add to this matrix an indication of the areas where Ontario has world class expertise, indicating the specific institutions and companies involved. A third step would be to add to the matrix a map of Ontario's infrastructure for innovation, showing the links to sectors and clusters in the provincial economy.

Recommendation 15: As the information base described above develops, the government should facilitate discussions with the private sector about future needs. The Centres of Excellence would be logical bodies to carry out many of these discussions. Understanding future needs is important in building the capacity to set priorities.

Recommendation 16: In addition, the government needs to develop a process for setting targets based on outcomes for its investment in innovation, and be in a position to measure results against these targets.

Recommendation 17: As the above steps are completed, the government should develop the capacity to participate with the private sector and institutions in the process of setting priorities, with some confidence that monies are being

allocated to broad areas of innovation that have potential in global market niches, build on existing strengths, that appropriate receptor capacity exists in the private sector, and that the public's investment in the infrastructure for innovation is generating an appropriate return on investment.

Recommendation 18: In order to provide the necessary leadership and capacity-building functions, the Task Force recommends that Technology Ontario be assigned the task of building the network described in No. 13 above, the information base described in No. 14 above, and the measurements described in No. 16 above. Technology Ontario is currently the strongest base of technology development expertise in the Ontario government system, and should be built upon. This work should take place in the context of continued collaboration between Technology Ontario and the new Task Force on an Innovation-Based Society. Technology Ontario should be assigned the additional resources necessary to carry out this task.

Recommendation 19: As part of its work, the new Task Force on an Innovation-Based Society should be asked to examine institutional arrangements in other countries, such as the Office of Technology Assessment in the United States, and determine their applicability to Ontario.

Recommendation 20: In the interim, Technology Ontario should report annually to the appropriate Cabinet committee on issues relating to the technology network and the information base within the Ontario government. This annual report from Technology Ontario should outline the strength and development of Ontario's technology infrastructure.

Recommendation 21: An effective, Cabinet level corporate body should be given the responsibility of coordinating various major programs to ensure that their effects are mutually reinforcing. This could take the form of a "Strategic Opportunities Fund," but there are other organizational mechanisms that could accomplish the same objective.

Publication of "Ontario 2002"

In order to encourage broader discussion and debate about wealth creation through innovation, the Task Force believes that *Ontario 2002* , with appropriate revisions, should be made available to the public as a working paper of Council.

Recommendation 22: That the Task Force prepare a revised version of *Ontario 2002*; that this version include an appropriate disclaimer indicating that it is a report to, not a report of, the Council, and that it is being published as a working paper of the Council; and that this revised version be available to the media and members of the general public who request a copy.

5. Appendices

5.1 Background

1. Background

The following section outlines the work of the Premier's Council on Economic Renewal, provides background on the Ontario Technology Fund, and describes the mandate, membership, and activities of the Task Force.

About the Premier's Council on Economic Renewal

The Premier's Council on Economic Renewal was established by Premier Bob Rae on February 1, 1991, as a successor to the original Premier's Council created by Premier David Peterson in 1986.

The original Premier's Council published two major reports. *Competing in the New Global Economy* appeared in 1988, and contained 14 recommendations designed to strengthen the structure of Ontario's economy. *People and Skills in the New Global Economy* was completed in 1990, and contained 32 recommendations to improve Ontario's educational system, enhance skills training, and facilitate labour adjustment. More than half of the recommendations in these two reports have been implemented by the current and previous governments.

Building on the work of the previous Council, the mandate of the Premier's Council on Economic Renewal is to accelerate economic renewal in Ontario, act as a change agent, in addition to advising on government policy.

To date, the Premier's Council on Economic Renewal has created four Task Forces and initiated two major projects:

- The Task Force on the Technology Fund in the Context of an Innovation-Based Society which is described in more detail below;

- The Task Force on Investment in Ontario deals with issues related to the investment climate in the province, long term competitive advantage, and marketing the province for investment;

- The Task Force on Lifelong Learning deals with the transformation of Ontario's public and private systems of education and training to support lifelong learning;

- The Task Force on the Organization of Work deals with issues related to the pace of innovation in the workplace;

- The Best Practices Project will report on the practices of successful Ontario businesses;

- The Comparative Indicators project will develop a new set of measurements for tracking our progress as a society.

For more information about the Premier's Council on Economic Renewal, please write or phone the Council Secretariat at the following address:

1 Dundas Street West, 25th Floor, Toronto, Ontario, M7A 1Y7
Phone: 416-326-6754; Fax, 416-326-6769.

The Ontario Technology Fund

The Ontario Technology Fund was established in 1986, at the same time as the founding of the original Premier's Council. The objectives of the Technology Fund were:

- to help companies develop, obtain, and use the best science and technology available for new products and processes;
- to support the export of advanced technology goods and services, and reduce the technology trade deficit;
- to ensure a supply of highly qualified personnel for industry in strategic areas;
- and to contribute to the creation of a science and technology culture in Ontario.

The Technology Fund was originally funded at $1 billion, to be allocated over a ten-year period. However, as a result of developments unforeseen at the time the Fund was established, it was fully committed by 1992-93. The biggest factor in the accelerated uptake of the Fund was the "super allowance," a tax expenditure to promote industrial R&D in Ontario. The Task Force on the Technology Fund in the Context of an Innovation-Based Society was established to provide advice concerning the future of the Fund.

In July, 1992, the Ontario Minister of Industry, Trade and Technology announced that $81 million a year would be committed to the direct funding of programs in the Tech Fund. The Centres of Excellence program will continue for another five years. Starting January 1, 1993, a total budget of $216 million has been allocated to the present seven Centres. In July, 1992, the Ontario Technology Fund was renamed "Technology Ontario."

More information on the Ontario Technology Fund and Technology Ontario is provided in the next section of the appendix. For additional information, please contact Technology Ontario at the following address:

Technology Ontario
56 Wellesley Street, 15th Floor, Toronto, Ontario, M7A 2E7
Phone: 416-314-8220; Fax, 416-314-8224.

Task Force on the Technology Fund in the Context of an Innovation-Based Society

(The Task Force is often referred to as the "Tech Fund Task Force" for short.)

The mandate of the Task Force was as follows:

> To review the Ontario Technology Fund's contribution to the creation of wealth through ideas based on an understanding of the prerequisites of wealth creation in a global economy, and to suggest the next steps for its program and administration.

The Task Force was chaired by Fraser Mustard, President of the Canadian Institute for Advanced Research. The following Council members served on the Task Force:

Pat Bird, Access Centre Coordinator, Times Change Women's Employment Service

Walter Curlook, Vice-Chairman, Inco Limited

Leo Gerard, National Director for Canada, United Steelworkers of America

Geraldine Kenney-Wallace, President and Vice-Chancellor, McMaster University

Les McLean, Vice-President, Stelco Inc.

Fred Pomeroy, President, Communication and Electrical Workers of Canada

In addition, the following people worked as part of the Task Force:

Sarah Bernstein, Project Director, Ontario Investment Fund Initiative, MITT

John Godfrey, Vice-President, Canadian Institute for Advanced Research

Gerald Heffernan, Director, Co-Steel International

Gordon MacNabb, President, PRECARN Associates Inc.

Peter Maurice, President and CEO, Canada Trust

Ron McCullough, President, KlasTek Ltd.

David Mackenzie, Assistant to the National Director, United Steelworkers of America

Chris Riddle, Coordinator, Laboratory Management Policy, Management Board

Martin Walmsley, Director, Technology Ontario

Andrew Williamson, Manager, Project Monitoring, Technology Ontario

Joe Wright, Vice President, Xerox Research Centre of Canada

Overview of Task Force Activities

The Tech Fund Task Force began its work in September, 1991. Its initial activities included a review of relevant reports documenting the state of innovation in Canada and Ontario.

The Task Force presented an interim report at the January 9/10, 1992 meeting of the Council, in order to respond to the government's request for advice regarding the Technology Fund related to the 1992-93 budget. The interim recommendations of the Task Force were as follows:

1. Continue partnership-based institutional structure, which requires codetermination (not just consultation) on policy.

2. Maintain current levels of real investment in Tech Fund programs pending further recommendations by the Task Force.

3. In collaboration with relevant Ministries, the Task Force should look at institutional arrangements in place for the remaining two-thirds of existing Ontario R&D support.

4. The Task Force should examine a full range of institutional options for the future to maintain and expand public-private partnership, and ensure maximum leverage for Ontario investment in innovation.

The January report also discussed some characteristics of an innovation-based society, and key strategic issues to be addressed in the transition to such a society. In particular, it examined the potential for the development of the IBEs necessary to support wealth creation through idea-based innovation in Ontario, and outlined some of the needs for financing innovation.

When the Premier's Council met on April 30 and May 1, 1992, the Task Force presented the highlights of a draft of *Ontario 2002*. From the discussion that ensued, it was clear that there was a need for further discussion of its main concepts — in particular, the idea of IBEs and codetermination. Over the summer, the Task Force's work included more than 25 meetings, divided into four areas of activity.

The first was called the "sounding out" process. The purpose was to meet with various informal subgroups of the Premier's Council to discuss the *Ontario 2002* report. Members from the financial industry met with Peter Maurice; business members with Ron McCullough; labour with David Mackenzie, education with John Godfrey; and government representatives with Tom Brzustowski and Fraser Mustard. In all cases, the discussions proved useful and led to further clarification and exchange of views.

The second area of activity, led by John Godfrey, focused on the financing of innovation. This began with a joint workshop held with representatives of the Ministry of Treasury and Economics, the Ministry of Industry, Trade, and Technology, and the Fair Tax Commission. This was followed by several other meetings exploring concepts of mutual interest. From this process emerged a recognition of the need to apply a "systems-thinking" perspective to enhancing the innovation capacity in the economy, and not simply to focus on particular government programs supporting research and development.

Ron McCullough led the third area of activity — developing a stronger base in innovative businesses — with the strategic opportunities concept. The objective was to explore a number of potential strategic opportunities and enabling technologies, to be in a position to present to Council some specific examples that had been examined by some of the people with a familiarity in the area.

The fourth area of activity, led by Gordon MacNabb, was directed at further contemplation of the role of government in wealth creation through idea-based innovation, and the evolution of the Technology Fund.

These activities confirmed the need to continue to focus attention on strengthening the primary wealth-creating sector, and the importance of continuing the momentum established by the Task Force. This activity led the Task Force to revise the contents of its recommendations in Chapter 4 of this report.

5.2 Acknowledgements

2. Acknowledgements

In addition to the members of the Task Force, and all the staff at the Ontario Technology Fund, we are grateful for the contribution of the following individuals and organizations. Nevertheless, the opinions expressed in this report are those of the Task Force.

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Carolyn Armstrong, Municipality of Metropolitan Toronto
Tim Armstrong, formerly with Ontario Ministry of Industry, Trade and Technology
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Harry Baumann, Ontario Ministry of Industry, Trade and Technology
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Clare Beingessner, B & W Heat Treating Ltd.; Premier's Council on Economic Renewal
Len Bolger, Canadian Institute for Advanced Research
Ken Boyd, Ontario Ministry of Agriculture and Food
Tom Brzustowski, Premier's Council on Economic Renewal
Rita Burak, Ontario Ministry of Agriculture and Food
Sherry Cameron, Ontario Ministry of Skills Development
Phyllis Clark, Ontario Ministry of Treasury and Economics
Rick Clayton, NGC Consulting
Eleanor Clitheroe, Ontario Ministry of Treasury and Economics
Brian Cox, University of Guelph
George Davies, Ontario Ministry of Energy
Michael Decter, Ontario Ministry of Health
Michael de Lint, Ontario Ministry of Housing
John Dirks, University of Toronto
Steve Dorey, Ontario Ministry of Treasury and Economics
DRI/McGraw-Hill
John Farrow, Coopers and Lybrand
Rick Findlay, Ontario Round Table on Environment and Economy
Jeff Finkelstein, Ontario Cabinet Office
Cathy Fooks, Premier's Council on Health, Well-being, and Social Justice
John Goudey, Ernst & Young
Janet Halliwell, formerly with the Science Council of Canada
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Martha Hayter, Technology Ontario
Dale Henderson, D. G. Henderson & Associates Ltd.
Peter Heywood, Architect (Group for Design in Business)
Geoffrey Houlton, Hemosol Inc.
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Ross Lawford, ORTECH International
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Michael List, International Semi-Tech; Premier's Council on Economic Renewal
Bill Macdonald, Canadian Gypsum Corporation
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Ted Newall, Novatech
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Gord Wilson, Ontario Federation of Labour; Premier's Council on Economic Renewal
David Wolfe, Cabinet Committee on Economic and Labour Policy
Karen Zavitz, Innovation Ontario

5.3 Background on Key Concepts

3. Background on Key Concepts

The following paper was prepared by the chair of the Tech Fund Task Force, Dr. J. Fraser Mustard, in order to provide additional background on key concepts underlying Ontario 2002.

Economic Growth, Prosperity, and Social Change

How Western countries moved in a period of less than 300 years from societies in which 90 per cent of the population lived in poverty to nations with a minority living in poverty is an important, but not well understood, story. In *How the West Grew Rich,*[1] Rosenberg and Birdzell analyse the economic transformation of the industrial world. They conclude that Western countries became prosperous because they freed themselves from the institutional barriers of older cultures that inhibited technological and institutional innovation. To appreciate the rise of ordinary citizens from abject poverty to standards of living that in earlier civilizations and in less developed countries today is reserved for a small group of privileged citizens, it is essential to understand the long-term determinants of economic growth in relation to concepts of wealth creation.

Since the publication of Adam Smith's *The Wealth of Nations,* attempts to understand how societies create wealth have led to the development of the academic discipline of economics. It's a relatively recent discipline in the history of the human race. Much of the public policy and regulation that govern our societies today are rooted in our understanding and beliefs about economic growth, or how nations create wealth. In English speaking cultures, the government departments that have the main responsibility for the nation's economy dominate the rest of government. The reasons for this are easily understood, since it is hard to maintain commitment to political institutions and to high quality social and physical environments if a nation cannot create the wealth to sustain its society. The discipline of economics has a crucial influence on the framework of understanding that determines a society's approach to wealth creation.

Understanding how societies create wealth requires an appreciation of the factors that lead to increases in productive capacity (creating goods and services of value to other individuals in a global economy), not in production itself. It is now better understood that technological innovation is a crucial factor in creating increased productive capacity. The neoclassical theory of economic growth treated technological innovation as something that comes from outside the economic framework and was not therefore crucial for policy and regulatory considerations. The old concept focuses on growth of capital and labour within the confines of existing technologies. The new concepts of economic growth include ideas and technological innovation as a key part of the framework for understanding the wealth creation process.

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[1] Nathan Rosenberg and L.E. Birdzell Jr., *How the West Grew Rich,* New York: Basic Books, 1986.

Wealth Creation and Changes in the Techno-economic Paradigm

How societies create wealth changes with the establishment of new ways to increase productive capacity. Major changes in wealth creation are often referred to as changes in the techno-economic paradigm. Examples of previous major changes are the harnessing of fossil fuels as a major source of energy, electricity and electric motors, and mass production techniques. In each paradigm there are a characteristic set of commodities, skill requirements, investment opportunities, infrastructures, institutions and business structures that are necessary.

The transition from one paradigm to another is a wrenching process. During most transitions, wealth creation capacity diminishes, income inequality increases, shortages of skilled manpower appear for the new paradigm, conflicts arise between businesses suited to the old order and businesses of the emerging order, and tensions of all sorts develop as policies, regulations and institutions designed for the old order became increasingly ill adapted to the new one. There is evidence that we are currently in such a transition process, in which the importance of people as the source of ideas is increasingly vital.

Ideas, Innovation, and Concepts of Economic Growth

Theories of economic growth that embrace technological innovation substantially change our framework of understanding. A key aspect of this new understanding is the replacement of the concept of "diminishing returns" to investments in physical or human capital by a concept of "increasing returns." An economy based on innovation can increase the scope of profitable opportunities for investment. A rise in the rate of capital investment in innovation creates a permanent increase in the rate of economic growth. This outcome is not considered to be possible under neoclassical economic theory, which treated technological innovation as something outside the realm of public or private policy.

The new concepts of economic growth are of fundamental importance for both the developing and the developed world. Factors that impair investment in innovation can have long-term negative effects on economic growth. Under the old theory, negative factors would depress growth in the short run but not in the long run. The new understanding of economic growth raises the possibility that developed nations that fail to adjust to the new economic framework may fall behind in their capacity to create the wealth required to sustain a prosperous and just society. Developing countries that fail to establish innovative economies will not become prosperous nations.

Until recently, economists had little of interest to say about economic growth. As *The Economist* stated in a recent essay, "The trouble is that, even by their standards, they (economists) have been terribly ignorant about it (economic growth). The depth of that ignorance has long been their best kept secret."[2] The short-term economic forecasts we are exposed to periodically are largely concerned with fluctuations in the "business cycle." This approach has little value in understanding why capacity increases or decreases over the longer term. For example, why has growth in productive capacity (wealth creation) slowed over the past two decades in the United States and Canada?

The old concept of economic growth, as expressed in neoclassical economics, predicts convergence of economies. This fails to give us any insight as to why economies were divergent in the first place. The historical experience and the new concepts make it evident that there will be periods of convergence and divergence depending on how economies respond to changes in techno-economic paradigms. Thus, if Canada fails to respond adequately to the present global economic changes, its wealth creating capability will decrease relative to other economies, leading to a lower standard of living and greater income inequality. We will have no choice but to become a society of diminished expectations.

Idea-based innovation can increase productive capacity in a society, can raise the return on investment, and can result in non-convergent growth rates among countries. Knowledge is a key factor in production, and has to be paid for by foregoing current consumption. Spending on ideas is an investment, whereas in neoclassical theory it is an expense. Past investment in ideas creates profits, which spur the generation of new ideas, which in turn spur further investment. A sustained increase in investment in ideas can permanently raise a country's standard of living.

The new framework of understanding concerning economic growth is not compatible with the neoclassical belief that our economies operate in a framework of "perfect competition" (a theoretical underpinning of policy instruments derived from neoclassical theory). Under the old theory, firms competed under the basis of having to take the price available in the market (price takers). In the new economy, firms with innovative products and services can set prices, raise output, capture more market share and make a bigger profit. The firms of the new economy are price setters, not price takers, and competition is imperfect. As the *Economist* points out, this turns the old theory and the policies and regulations derived from it, inside out.[3]

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[2] Economic Growth, “Explaining the mystery,” *The Economist*, 15-18, January 4, 1992.

The economics of objects is substantially different from the economics of ideas. An economic framework for setting policy and regulation based on objects is potentially dangerous for a society attempting to move to idea-based innovation as a primary base for wealth creation.

Economic Policy Agenda

As Lipsey and others have pointed out[4], the period of transition to the new global economy centred on idea-based innovation will be characterized by structural changes in the economy and society. This will require a profound transformation of the institutional and social framework. This tranformation will be a conflict-ridden process. How well it is managed will depend in part on the political and cultural characteristics of a society.

Nations that do not understand the nature of the required economic policy changes will have difficulty in establishing the appropriate collective will to manage the transition. How each nation copes with the early stage of the transformation may set its fate for the next few generations.

Financing Innovation

A key issue in the new economy is the financing of idea-based innovation. Analysis of this brings out some differences between the financing of objects versus ideas.

The property rights of objects (ownership) is easily understood and controlled whereas the property right of ideas is less easily defined and controlled. It is relatively easy for financial institutions to finance objects. In the case of ideas, it is hard to define collateral and the question of ownership is unclear because of the speed with which ideas diffuse.

Financing all components of innovation (including basic and applied research, product development, securing market share, and process improvement) is high risk and capital intensive. Societies have to create new institutional structures that finance and do this innovation. Current accounting practices fail to account appropriately for the costs of innovation. Taxation and other policies can create disincentives to investing in innovation and creating new business enterprises. Until these basic issues are addressed, it is difficult to build an innovative economy. A crucial test facing Canada is finding a way to create institutional structures appropriate for the financing of innovation. Without it there is little chance that we will be able to make the transition to an innovation-based society.

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[3] Economic Growth, "Explaining the mystery," *The Economist*, January 4, 1992, p. 95.

[4] Richard Lipsey, "Globalization and Technological Change," Notes for Address to International Trade Advisory Committee (ITAC), August 1992; and "Economic Growth: Science and Technology and Institutional Change in a Global Economy", CIAR Publication No. 4, June 1991.

Several studies have now addressed the primary issues surrounding the financing of innovation. They all set out the strategies that are key and the policy and regulatory issues that have to be faced.

These issues include:

1) improving the macroeconomic environment;

2) facilitating new institutional structures that take into account new goals of owners and lenders and allow modified corporate ownership structures to emerge;

3) improving the information and risk sharing relationship among financial institutions and the primary wealth creating sector;

4) creating investment incentives for innovation that help to shift the goals of corporations in the primary wealth-creating sector.

Governments and Public Policy

Societies' attempts to create new innovative economies will influence governance and public policy in a variety of ways. During this century there have been three powerful political economic systems based in part on older economic concepts:

a) centrally planned and operated economies;

b) individualistic economies (*laissez-faire*) characterized by piecemeal government policy interventions responding to short-term political pressures — this has been dominant in the United States, Canada and the United Kingdom;

c) capitalism in a societal context — "massaged market economies" — the market is the final test of success in a free trade environment, but substantial government guidance through policies, rules and regulations is given to the forces of innovation and technological change. These forms of capitalism are to be found in non-English speaking Western European countries and Asian countries with a strong commitment to idea-based wealth creation.

The first type of economic system has now been abandoned and b) and c) are in active competition with each other. Much of the evidence from the analysis of innovation-based economies is that some form or forms of capitalism in a societal context will be dominant in the new global economy.

There are some basic rules for creating a capitalist economy that is systematically oriented toward innovation and economic growth. There must be a market test to provide for elimination of failures. There must be a clear pursuit of economic growth through government policies focused on wealth creation in a societal context. There needs to be stability in the instruments of governance. At present, most Canadian public policy interventions fail on all of these accounts. A key question is, therefore, can we evolve forms of stable democratic governance and appropriate policies necessary for building the new innovation-based economy?

Primary Wealth Creation and Tradeable Goods and Services

A concept that emerges from the new economic growth theory is that the traded goods and services produced through idea-based innovation have a major effect on the wealth base for the other parts of society. This sector can then be considered the primary wealth creating sector. (This is an issue Adam Smith discussed in *The Wealth of Nations*). Firms in the primary wealth creating sector sell their output for a price sufficient to cover costs in competition with other global competitors in domestic and foreign markets. Trade in high value products and services is crucial for a high standard of living, for the ability to pay high wages, and our capacity to support other sectors of our society such as education, health care and domestic retail services. Since these sectors affect society as well and are important for the quality of our life, they can be considered as secondary wealth creating sectors. But by themselves, they cannot produce the wealth needed by a modern society.

It is important for a small society like Canada to appreciate the overriding importance of its tradeable goods and service sector in primary wealth creation. When the primary wealth creating sector falters, it drags down the secondary wealth-creating sectors, which reduces our quality of life. The old economic theory tended to treat all outputs in the economy as being equal in wealth creation. The new concept clearly brings out the importance of a healthy primary wealth creating sector. Priorities for nations during a period of deep economic change should be centred on protecting key elements of our social environments while investing in the building of an adequate base of idea-based innovative businesses in the primary wealth creating sector.

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5.4 Ontario's Technology Fund

4. Ontario's Technology Fund

Prepared by Technology Ontario, Ministry of Industry, Trade and Technology

The Ontario Technology Fund was created in 1986 to help move Ontario to the forefront of scientific leadership and technological innovation. The creation of the Fund was based on the recognition that in today's fiercely competitive economy, Ontario can no longer rely on its natural resources and traditional manufacturing strengths. Our economic future depends on our ability to develop the new products and processes that will create the jobs and industries of tomorrow.

The Technology Fund represented a major commitment by the Government of Ontario — $1 billion over ten years. However, the ultimate contribution made by the Fund will undoubtably be many times greater because it is stimulating new levels of research and development by the private sector.

Over the past six years, a number of innovative programs have been introduced under the auspices of the Fund. These range from Centres of Excellence in technologies vital to the province, to financial support for research projects that deal with the effects of technological change on workers and the workplace.

In July, 1992 the program was renamed "Technology Ontario."

Review of Programs

In the years 1986/87 to 1991/92:

- $317.5 million has been spent on direct funding programs
- an additional $364.5 million has been committed to 1996/97*
- $404 million has been offset for R&D tax rebates to 1995/96

*Includes commitments over the next five years to the Centres of Excellence (1993/97)

The budget of the Ontario Technology Fund (OTF) is the responsibility of the Ministry of Industry, Trade and Technology. Annualized, the budget for 1990/91 was $85 million, or 41 per cent of the Ministry's program budget. In 1991/92, the figure was $81 million, or 45 per cent of the program budget. The budget for 1992/93 is $81 million. This target is now fixed on an annual basis as the commitment to devote one billion dollars over ten years has been met.

In order to fulfil the goal, the following strategies are employed:

- Support the creation and use of the best science and technology through grants to reduce the high risk of research and development
- Develop highly qualified personnel in conjunction with support of research and development in strategic areas in industry and academia
- Use government financial support to require industry and academia to promote a science and technology culture
- Promote cooperation among industry, academia, labour and government
- Use advice external to the government to design, implement and monitor programs to ensure innovative programs and maintenance of high standards of excellence.

The programs are designed to be proactive and to promote change over a three to ten-year period. The programs and funding allocations for 1991/92 are presented in Table 1. For the purpose of this report, four programs will be described in detail — the Centres of Excellence, the Industry Research Program, the University Research Incentive Fund and the International Research Agreements.

Table 1

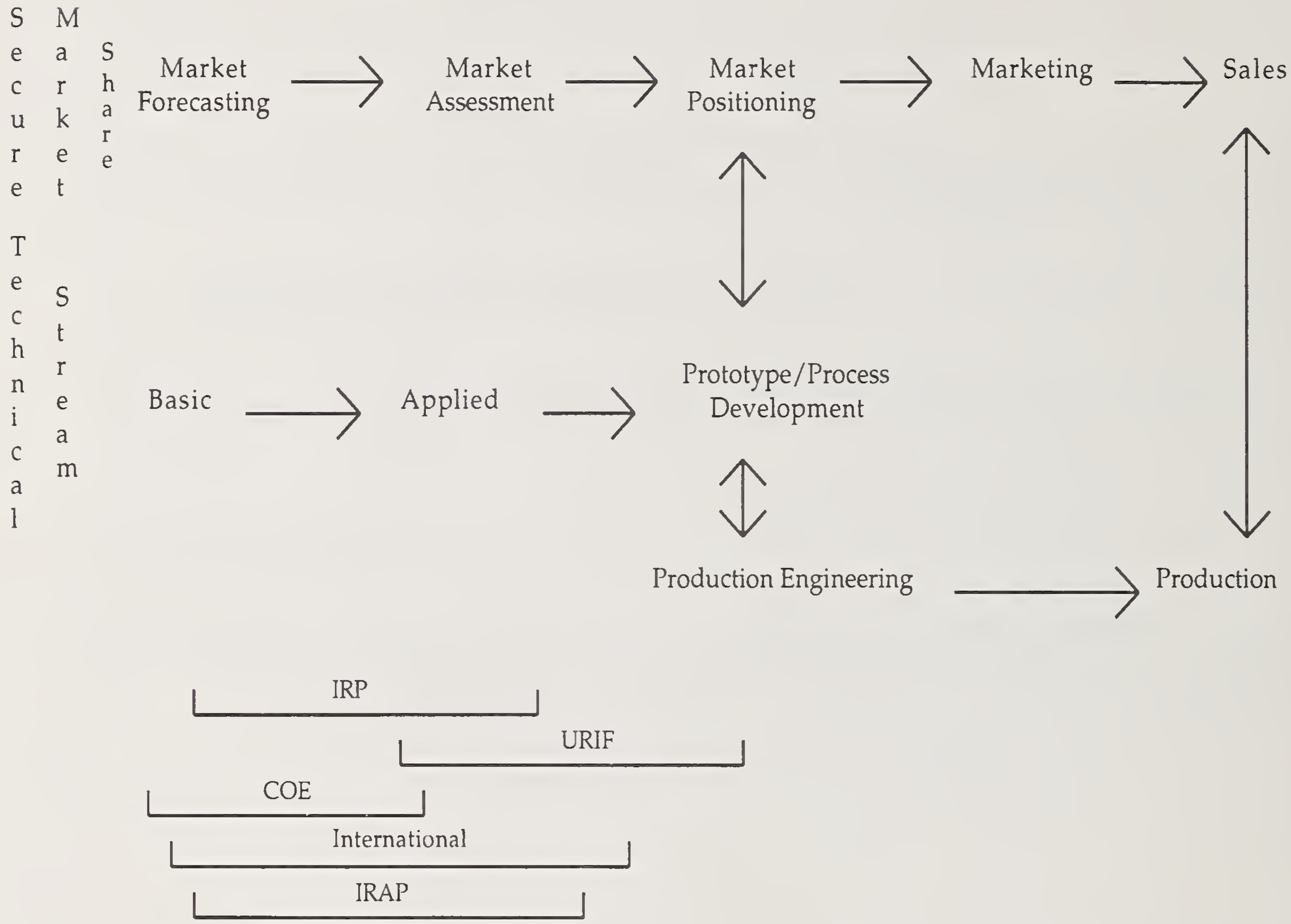
Programs ($ millions)	**91/92 Actual**	**92/93 Budget**
Centres of Excellence Ontario Technology Fund Secretariat (TO)	40.8	39.0
Industry Research Program (TO)	21.4	22.2
University Research Incentive Fund Ministry of Colleges and Universities (MCU)	6.7	*5.4
International R&D Projects (TO)	1.1	1.1
Telepresence	0.4	0.8
Technology Adjustment Research Program (TO)	0.8	0.5
Centres of Entrepreneurship (MCU)	0.9	*0
Technical Personnel Program (MITT)	4.6	6.0
Radarsat (TO)	5.0	5.2

Programs ($ millions)	**91/92 Actual**	**92/93 Budget**
ORADP (TO)	0	0.8
Total:	81.7	81.0
R&D Super Allowance (Approx.) Ministry of Treasury and Economics	50.0	50.0

* incremental funding for one year new funding in its budgeting to Ministry of Colleges and Universities etc.
TO - program managed by the Ministry of Industry, Trade, and Technology — Technology Ontario
MCU - program managed by the Ministry of Colleges and Universities
MITT - program managed by the Ministry of Industry, Trade and Technology — Small Business Ontario

All of these programs are concerned with research and they span the economic time horizon from one to two years (URIF) to 10-15 years (Centres of Excellence). They are interrelated and comprise about 80 per cent of the direct program funding. How these programs fit into the innovation cycle is provided in Table 2.

Table 2 R&D Assistance Program vs The Innovation Cycle



Centres of Excellence

The seven Centres of Excellence were selected in 1987 from 28 applications by a panel of international experts. The goal of the program is to "stimulate the production of advanced, world class research, to train and deliver world class researchers over the long terms and to encourage the transfer and diffusion of technology".

The original allocation was $204 million from 1987/88 to 1992/93. The program has been renewed for an additional five years at a total budget of $216 million.

Each Centre is a distributed network comprising the best researchers in several universities. Each Centre is constituted as a not-for-profit corporation. The affairs of the Centre are governed by a Board of Directors who are responsible for the administration of the contract between the Centre and MITT. The management of the Centre is small, comprising a president and about six office staff.

The Board of Directors comprises representation from industry and academia and is considered to be a key element in the success of the Centre's program.

In 1990 a major review of each Centre and the program was conducted. Each Centre was reviewed for a week by a panel of five to seven international experts. The chairs of each panel joined the Premier's Council on the Centres of Excellence to review the program. The report was tabled with the Premier in July, 1990.

The principal findings of the review, which recommended continued funding for a further five years, were:

- Outstanding quality of researchers and programs
- Major role played by provision of good equipment
- Recruitment of excellent researchers
- Evidence of cultural change in academia and industry
- Outstanding quality of graduate students (about 200)
- Work still remains to improve networking
- Industry linkages developed beyond level expected at this time
- Excellent management.

The performance indicators of the Centres after the first three years of operation are shown below.

The government announced in December, 1991 that funding will be provided to continue the Centre program for a further five years.

Centres of Excellence: Performance Measures 1987 - 1992

Goal 1: to stimulate the production of advanced, world class research

	Base	88/89	89/90	90/91	91/92
Refereed Publications	1485	1720	1920	2253	2321
Invited Papers/ Lecturers	637	818	830	1380	1202
Total Government Support (non-OTF) $ millions	31.8	38.6	40.0	50.4	54.6

Goal 2: To train and develop world class researchers over the long term

	Base	88/89	89/90	90/91	91/92
Grad Students	1378	1696	1958	2190	2213

In 1991/92

- 85 per cent of students were Canadian
- of the 509 students who left the Centres program in 1991/92:
    - 52 per cent joined firms in Canada (37 per cent in Ontario)
    - 23 per cent went to academia
    - 25 per cent went elsewhere

Goal 3: To encourage the transfer and diffusion of technology to industry

	Base	88/89	89/90	90/91	91/92
Patents	35	37	54	65	73
Licenses to Industry	17	20	30	36	50
Industry Contracts $ millions	5.6	13	14.2	16.9	14.4

Leveraging 1991/92

Corporate Cash and In-kind	$21.6 million	18 per cent
Total Government Support (Non-OTF)	$54.6 million	46 per cent
Technology Fund Grant	$40.8 million	35 per cent

The government has renewed the mandate of the Centres of Excellence for 1992/93 to 1997/98. The budgets for the next five years are as follows:

Centre	1987-92 ($million)	1993-97	Increase
Groundwater	8.00	11.00	3.00
Information Technology	35.00	36.25	1.25
Laser and Lightwave	22.00	23.00	1.00
Manufacturing	31.00	32.75	1.75
Materials	43.00	44.50	1.50
Space and Terrestrial Science	39.00	39.50	0.50
Telecommunications	26.00	29.00	3.00
Total	204.00	216.00	12.00

Industry Research Program

The goal of the Industry Research Program is "to stimulate cooperative ventures in research, development and technology applications in areas of strategic importance".

The program does not have a fixed annual allocation. A committee of the Premier's Council under the Chair of Norman Kissick recommended an allocation of $40 million (so has the recent Peat Marwick review). However, as new programs have been added to the Fund and as annual Fund allocations have been capped and decreased, annual expenditures are now in the order of $23 million. Due to cash flow constraints, no new projects are being accepted into this program until early 1993.

A list of current projects with the breadth of operation in the innovation cycle is given in Table 3.

Table 3 - Industry Research Program Projects

Company	Grant $ million	Ownership	Ontario Mfg.	Basic	Applied	Product Dev	Market Dev	Process Dev & Impl
Adcom	0.97	Canadian	√		—	—		
CAL	2.48	Canadian	√		—	—		
Cancarb	1.43	Canadian	√		—	—		
Ciba-Geigy	2.19	German	√	—	—	—		
Cognos	8.53	Canadian	√	—	—	—		
Connaught	13.38	German	√	—	—	—		
CSDA	22.70	German	√		—	—		—
Formtech	3.48	German	√		—	—		—
Ottawa Heart Institute	2.83	Canadian	√	—	—	—		
Imax	5.54	Canadian	√		—	—		
Inco	2.81	Canadian	√					—
ISG	4.78	Canadian	√	—	—	—		
Jacmorr	0.86	Canadian	√		—	—		—
Linamar	4.20	Canadian	√		—	—		
Hydro (CFFTP)	9.40	Canadian	√	—	—	—		—
Pylon	1.51	Canadian	√	—	—	—		
QSI	2.08	Canadian	√	—	—	—		
Ross Video	0.66	Canadian	√		—	—		
Sciex	17.93	Canadian	√	—	—	—		
Semex	3.18	Canadian	√	—	—	—		
Telesat Mobile	4.86	Canadian	√		—	—		
Ultra Laser Technology	0.82	Canadian	√		—	—		
Unitron	2.13	Canadian	√	—	—	—		
Waterloo Science	1.53	Canadian	√		—	—		

It should be noted that all research and manufacturing will be carried out in Ontario and all but three companies are Canadian owned.

The criteria for entry to the program are:

- Leading edge industrial R&D in areas of strategic importance
- Demonstrated export or import replacement potential
- Grants up to 50 per cent of eligible costs
- Minimum of two partners
- Impact on human resources development

About 2,000 funding enquiries have been received. Most are referred to other funding agencies, e.g. IRAP (Ottawa), Innovation Ontario or the Ontario Development Corporation. Fifty-two projects were assessed in detail and 24 were selected. Each project application is assessed by about 20 specialists, most external to government. The applicants are interviewed for three hours prior to a recommendation being made on funding by those who have carried out the assessment. The assessment and approval process takes about six months.

Projects are assessed for:

- Scientific merit and risk
- Enhancement of technology base
- Economic benefit
- Management skills
- Ability to finance
- Development of skills
- Labour impact

Most companies in the program have the following profile:

- Sales: $5 - $100 million per year
- Exports: 40 - 80 per cent of sales
- R&D: 4 - 20 per cent of sales
- Ownership: Canadian
- Manufacturing: Ontario
- Average Grant: $5 million
- Average Project Length: 4 years

Note: Recent data suggests that in industry, the total costs of supporting one principal research investigator is $300,000 to $350,000 per year in the U.S.A. The Canadian figure is similar.

In 1991, the program was reviewed in depth by Peat Marwick. A summary of their findings follows:

- Ontario's industrial R&D community views the program favourably
- The project selection process works well but could be enhanced
- Industrial support programs exist in most industrial jurisdictions
- The program is achieving its objectives:
  - Increased scientific activity
  - Three out of nine projects assessed are already commercially successful
  - Positive net public benefits
  - Exports
  - Signs of increased competitiveness
  - Development of permanent industry/academia linkages
  - Research and manufacturing occurs in Ontario
  - Inter-company linkages are evident
  - $34.5 million IRP support should generate $944 million sales by 1997 (nine projects)

The main recommendations from the review were as follows:

- Program should be continued. Budget set at $40 million
- Give more emphasis to marketing and business plan
- Support a mix of high and low-risk projects
- Offer a choice of funding options
- Ensure continued R&D efforts by companies
- Alternative structural options for IRP/Technology Ontario should be studied:
  - Creation of agency whose objective would be: "To lead and support the creation of a world-competitive provincial scientific and technical industrial sector in line with Ontario's social and economic development"
  - Expanded scope and more autonomy

- Attract investment funds from private sector. Plough back repayments and royalties from successful projects.

The government is currently considering the conditions under which the program might be refunded in 1993.

University Research Incentive Fund

The University Research Incentive Fund (URIF) was initiated in 1984 and became a program in the Technology Fund in 1986 following an in-depth program review.

The goal of URIF is to encourage university-industry research collaboration. The program will match, dollar for dollar, eligible corporate investments in university-based contract research projects. Applications are submitted by universities. Projects may be of up to three years duration and are not restricted to any particular discipline or area of research.

The applications are assessed by a Selection Committee comprising industry, government and academic representatives. Members of the Committee are appointed by Order-in-Council and make their recommendations to the Minister of Colleges and Universities.

Since 1984:

- 1,117 applications have been received
- 611 projects funded
- 112 projects under evaluation
- URIF commitments, $51.2 million
- total value of research, $137.5 million
- Average URIF award, $83,900
- average project cost, $225,000
- funding leverage is 1.7 : 1
- 16 universities and 320 companies involved

In 1991 the program was reviewed by an independent consultant (The Impact Group), who recommended that:

- The program is successful and should be continued

- Funding should be set at $22 million over 3 years i.e. 90 per cent of the present level

- Maintain the matching formula at 1:1

- Set a limit of a $200,000 grant per project

- Encourage the participation of small to medium-sized companies by developing linkages with other programs with close cornerstones with small companies, i.e. MITT and National Research Council (NRC) field offices, the Technical Personnel Program, ORTECH International, Centres of Excellence.

- Develop a better database

- Improve and increase communications activities.

Technology Ontario has ongoing financial commitments to URIF (see Table 1). In 1992/93 the government allotted $3 million for one year to URIF, to be located in the budget of the Ministry of Colleges and Universities. The total 1992/93 URIF budget is therefore $8.8 million. Discussions on long-term funding for URIF are in progress.

International Research Programs

The three international research programs comprise part of Ontario's bilateral and multilateral commitments to the Four Motors for Europe — Baden-Württemberg, Catalunya, Lombardia and Rhône-Alpes. The programs comprise the technology components of the agreements.

The objectives of the programs are to:

- Support the government's initiatives to develop ties with Europe via the Four Motors For Europe

- Develop joint applied research projects that further cooperation and economic activity between learning academics and industry in designated jurisdictions

- Bring companies together through an interest in a common technology

There are currently three programs. The bilateral programs (Baden-Württemberg and Rhône-Alpes) are allocated $2.0 million each, over four years. The multilateral program (Telepresence) is allocated $2.6 million over three years.

The status of the programs are as follows:

Baden-Württemberg

There are three joint projects between universities and institutions in the two regions. The projects are in:

- Local area network design
- Computer-assisted process planning and control
- Diode pumped lasers

The first annual review was conducted in March, 1991 in Toronto. All projects are proceeding well. Scientist interaction is higher than expected and interesting side benefits are developing. It was recognized that during the second year, industry needs to be more involved in the projects. The next review was in Stuttgart in February/March 1992.

Rhône-Alpes

This is the second of the bilateral agreements to be signed. The four projects are:

- Solid Waste Management (fly-ash from incinerators)
- Medical imaging
- Biomaterials, especially in dentistry
- New laminated ceramics

The first annual review was conducted in November, 1991 in Toronto. All projects are proceeding well. Scientist interaction is much higher than expected. Good technology transfer is occurring. A number of scientific papers have been or are being published. One industry license has been negotiated by an Ontario company. During the second year more industry involvement is planned. In November, 1992, at the end of the above four projects, three new projects were assessed.

Multilateral - Telepresence

This program was approved in November, 1991 with a budget in Ontario of $2.6 million over three years. The project is in multi-media telecommunications. Ontario will supply the base technology with input from the Four Motors. Each region's industry will then develop application for the technology in field trials. Ontario will concentrate on Desktop Video conferencing and uses in a clinical environment (Radiology).

The Ontario consortium will probably comprise Bell, Xerox, IBM and several smaller companies.

Agreements have been signed to date by the Premier with Baden-Württemberg, Rhône-Alpes, and Catalunya.

International Research Program Achievements

The achievements to date are:

- Good networking
- Unexpected side benefits, eg. inter-institutional agreements and student exchanges
- One industry license
- Harmonization of standards between Canada and the European Economic Community (EEC) in research
- Reduction of inter-regional cultural barriers

The challenges remaining are:

- To develop permanent relations at the institutional and firm level
- To build on inter-institution relations to develop inter-firm relations
- To increase industrial participation
- To use the research, especially Telepresence, to gain access to the EEC research programs in the long term

Other Programs

In conclusion, brief descriptions of other programs are provided:

Centres of Entrepreneurship

The program is administered by the Ministry of Colleges and Universities. Six centres were developed as a pilot project to foster a climate of entrepreneurship.

The budget for four years was $3.6 million (fiscal years 1988/89 to 1991/92 inclusive).

The Centres promote the teaching of entrepreneurship in colleges and universities and stimulate research on the subject.

The six Centres are located at:

- Canadore College/Nipissing College
- Centennial College
- Confederation College/Lakehead University
- Ryerson Polytechnical Institute
- St. Lawrence College/Queen's University/Loyalist College
- York University

The centres were reviewed in 1991. The reviewers recommended continuation of the program. In 1992/93, the government allocated $600,000 to the Centres of Entrepreneurship, now renamed the Centres for Economic Development. The budget, and responsibility for, this program now resides with the Ministry of Colleges and Universities. The future of funding for these Centres beyond 1993 is uncertain.

Technology Adjustment Research Program

The Technology Adjustment Research Program (TARP) was initiated by the Premier's Council in recognition of the need to strengthen labour's role in dealing with the effects of technological change on workers and the workplace. Understanding the effects of new and changing technologies can minimize and overcome the disruption to workers' lives and jobs, and the production process, that can result from technological changes.

A key aim of the program, which is being managed by the Ontario Federation of Labour through Technology Ontario, is to bring workers and management together to address this important area of concern. While the research is directed by labour representatives, it will be done in cooperation with management.

The program provides for a total of $5.5 million in funding over five years. Projects approved to date range in size from $30,000 to $500,000, and include:

- Demonstration activities in training, technology, job design and work organization in the Canadian automotive industry

- A series of case studies on the impact of new technologies in the mining, smelting and refining, steel-production and steel-fabrication industries

- A study of the impact of new, decentralizing computer technologies on public service workers

- Research on the impact of a variety of types of new technologies in the pulp, paper and forestry industries

- Research into the effects of technological change on the various subsectors of the electronics and electrical manufacturing industries.

A peer review of the research programs is taking place in 1992/93.

Technical Personnel Program

This program is administered by the Ministry of Industry, Trade and Technology.

The Technical Personnel Program (TPP) was officially launched in September, 1989, to help smaller Ontario companies increase their technical and scientific expertise. As of October 30, 1992, more than 760 applications had been approved.

The program, which pays part of the salary of new engineering, scientific and technical staff over a three-year period, is designed to encourage small companies to better develop and apply advanced technology. The $38 million program expected to result in the hiring of up to 1,000 technical staff by small firms over the next five years.

So far, most of the interest has been shown by manufacturing companies, even though the program is also open to service sector firms. Almost 90 per cent of applications were from manufacturers.

The program also features close cooperation with field staff from the National Research Council, who are helping with the technical assessment of proposed projects.

Radarsat

Radarsat is a major research and development project by the Canadian government to produce Canada's first earth observation, remote sensing satellite. The satellite will use synthetic aperture radar to collect data about the Earth's surface under all weather and light conditions, offering tremendous potential benefits in mapping, weather forecasting and resource management.

Radarsat represents a significant advancement over existing remote sensing satellites, which use optical instruments to collect data and are, therefore, limited by cloud cover and light conditions.

Technology Ontario's involvement with Radarsat came as a result of an invitation from the federal government to participate in funding the construction and launching of the satellite. Under the agreement, Technology Ontario will contribute up to $25 million toward the project in support of contracts issued to Ontario companies.

Coincidental with the building of the satellite, Technology Ontario plans to build on its Radarsat investment by developing a Radar Data Program in conjunction with the federal government and private industry. This program, which began in 1990/91, is designed to help develop the image processing and analysis capabilities of Ontario's remote sensing industry. It will be managed by the Ontario Centre for Remote Sensing.

This concludes the review of direct funding programs that comprise the $81 million annual allocation to the technology fund for 1992/93.

Research and Development Super Allowance

Governments around the world have recognized that private-sector investment in the development and application of new technologies is integral to the generation of wealth and the creation of high-value, high-wage jobs.

Ontario's R&D Super Allowance is designed to encourage greater private sector R&D investment in the province by providing tax incentives for companies just beginning and those already conducting research projects. The program provides an upfront deduction against Ontario taxable income for R&D expenditures incurred in the province. The deduction is 25 per cent of qualifying R&D expenditures for larger companies, and 35 per cent for small firms. This increases by 50 per cent for incremental expenditures to 37.5 and 52.5 per cent, respectively.

Since 1988/89, the R&D Super Allowance has offset about $180 million in taxes, representing a significant contribution by the province in sharing the risk of the research. In 1991/92, the deductions totalled $50 million.

So far, a variety of companies have taken advantage of the deduction, using it as a stepping stone into more technologically driven and high value-added products and markets. However, this aspect of the Technology Fund has not yet been evaluated.

The Future

In July, 1992, the Minister of Industry, Trade, and Technology announced that:

> In order to give more long-term permanence to the programs in the Technology Fund, I am pleased to announce that $81 million a year will be committed to the direct funding programs in the Technology Fund. When the Fund was originally announced in 1986 the former government capped funding for it at $1 billion. This amount has been fully committed. The new funding represents a major long-term commitment by the Ontario government to support industrial innovation. In recognition of this broader scope we have renamed the program "Technology Ontario." As an instrument of industrial policy, the government is committed to supporting Technology Ontario in the future.

The mandate of Technology Ontario is currently being reviewed as part of the repositioning of the Ministry of Industry, Trade, and Technology, as well as in the light of recommendations made in Chapter 4 of this report.

5.5 Summary of Recommendations

5. Summary of Recommendations

Recommendation 1: The Premier's Council on Economic Renewal should help develop and communicate an overall Strategic Plan for Wealth Creation in Ontario.

Recommendation 2: A Strategic Opportunities Task Force should be created with a core of members from the Tech Fund Task Force, supplemented by other new members.

Recommendation 3: The Strategic Opportunities Task Force should launch and oversee two pilot processes, one focused on a strategic opportunity, and another on an enabling technology. Resources from the Premier's Council Secretariat and from relevant ministries should be assigned as required to support these pilot processes, with a target completion date of June, 1993. While the Tech Fund Task Force believes that the World House and biotechnology would be useful projects, it does not wish to preclude the possibility of alternative ideas emerging from the new Task Force. **The objective of each pilot project would be to develop a strategy for Ontario as a province relating to the strategic opportunity or enabling technology.** It is anticipated that the process will put businesses and other participants in a position to assess the risks and opportunities involved, and determine what actions would need to be taken by business, labour organizations, research, financial institutions, and the Ontario government in collaboration with other levels of government. It should be noted that the Task Force believes that the pilot projects should be open to participants from elsewhere in Canada.

Recommendation 4: Based on the experience of these pilot processes, the Strategic Opportunities Task Force should advise on the institutional capabilities required in Ontario and Canada to deal with similar processes in the future.

Recommendation 5: The Strategic Opportunities Task Force should develop an ongoing process for identifying other strategic opportunities and enabling technologies that are not currently being developed elsewhere, explore opportunities identified with members of the private and public sectors, and present their findings at subsequent Council meetings. A way of communicating these ideas should be developed to create the possibility that some opportunities would be pursued spontaneously by the private sector.

Recommendation 6: A Task Force on an Innovation-Based Society should be created with a core of members from the Tech Fund Task Force, supplemented by other new members. This new Task Force should carry on the detailed work involving the various components of the "innovation system," using a process of collaborative exploration and analysis and building a framework of understanding.

Recommendation 7: The new Task Force should continue the dialogue with individuals and groups in all parts of society about the framework of understanding at the basis of our recognition of the need for change, to help lay the groundwork for codetermination and recognition of reciprocal obligations.

Recommendation 8: The Tech Fund Task Force commends the government for recognizing the Tech Fund programs as an important investment for the future through its long-term commitment of $81 million per year to the Tech Fund programs, and urges the government to establish a stable, long-term source of funding for URIF as well as the other programs.

Recommendation 9: Codetermination should continue to exist in the development and operation of the programs administered by Technology Ontario.

Recommendation 10: The Premier's Council on Economic Renewal should have a continuing role in providing strategic direction in the evolution of Technology Ontario.

Recommendation 11: MITT should be requested to provide the Premier's Council with its recommended design of the mechanisms through which the Council continues its involvement with Technology Ontario.

Recommendation 12: Since MITT is being restructured, the government should take advantage of the opportunity to bring all of MITT's technology-oriented programs under the Technology Ontario structure. In the operation of Technology Ontario, it is essential to continue to use the former Technology Fund programs to encourage codetermination and new institutional links and structures.

Recommendation 13: The government should create an effective network of people involved in science and technology related to the development of an innovative economy throughout the Ontario government. This network should meet regularly to establish relationships and exchange ideas, and develop a set of training courses on managing technology development.

Recommendation 14: The government should, in incremental stages, develop a comprehensive information base on Ontario's technology infrastructure necessary for an innovative economy. The first step in this process should be to develop a matrix that shows spending on technology development and innovation by each ministry and agency, mapped against the technologies being developed. The second step should be to add to this matrix an indication of the areas where Ontario has world class expertise, indicating the specific institutions and companies involved. A third step would be to add to the matrix a map of

Ontario's infrastructure for innovation, showing the links to sectors and clusters in the provincial economy.

Recommendation 15: As the information base described above develops, the government should facilitate discussions with the private sector about future needs. The Centres of Excellence would be logical bodies to carry out many of these discussions. Understanding future needs is important in building the capacity to set priorities.

Recommendation 16: In addition, the government needs to develop a process for setting targets based on outcomes for its investment in innovation, and be in a position to measure results against these targets.

Recommendation 17: As the above steps are completed, the government should develop the capacity to participate with the private sector and institutions in the process of setting priorities, with some confidence that monies are being allocated to broad areas of innovation that have potential in global market niches, build on existing strengths, that appropriate receptor capacity exists in the private sector, and that the public's investment in the infrastructure for innovation is generating an appropriate return on investment.

Recommendation 18: In order to provide the necessary leadership and capacity-building functions, the Task Force recommends that Technology Ontario be assigned the task of building the network described in No. 13 above, the information base described in No. 14 above, and the measurements described in No. 16 above. Technology Ontario is the currently the strongest base of technology development expertise in the Ontario government system, and should be built upon. This work should take place in the context of continued collaboration between Technology Ontario and the new Task Force on an Innovation-Based Society. Technology Ontario should be assigned the additional resources necessary to carry out this task.

Recommendation 19: As part of its work, the new Task Force on an Innovation-Based Society should be asked to examine institutional arrangements in other countries, such as the Office of Technology Assessment in the United States, and determine their applicability to Ontario.

Recommendation 20: In the interim, Technology Ontario should report annually to the appropriate Cabinet committee on issues relating to the technology network and the information base within the Ontario government. This annual report from Technology Ontario should outline the strength and development of Ontario's technology infrastructure.

Recommendation 21: An effective, Cabinet level corporate body should be given the responsibility of coordinating various major programs to ensure that their effects are mutually reinforcing. This could take the form of a "Strategic Opportunities Fund," but there are other organizational mechanisms that could accomplish the same objective.

Recommendation 22: That it prepare a revised version of *Ontario 2002*; that this version include an appropriate disclaimer indicating that it is a report to, not a report of, the Council, and that it is being published as a working paper of the Council; and that this revised version be available to the media and members of the general public who request a copy.

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Ontario. Task Force to
Review the Ontario
Technology Fund in the
Context of an Innovation
Based Society.

Ontario 2002.

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